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The future is digital: Digital agriculture and Canadian agriculture policy

A *Research Report* prepared for CAPI in collaboration with EMILI by Kyle Hiebert, Dan Lussier, Elisabeta Lika, and Tyler McCann

Research Report

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Note from CAPI

This report examines digital agriculture's role in strengthening Canadian farming amid rising costs, trade pressures, and climate challenges. The research stems from a need to understand why adoption lags despite the clear potential for gains in productivity, competitiveness, and sustainability. It matters now because Canada's agricultural policy, including the 2023-2028 Sustainable Canadian Agricultural Partnership, overlooked digital agriculture as a priority, leaving farmers exposed as global competitors leap ahead. With the next Federal-Provincial-Territorial agreement approaching, this gap demands attention.

Farmers face a critical decade. Many are aging out, consolidating, and passing the reins to a tech-ready generation. Others are keen to embrace new, readily available technologies that can enable better business practices, but they require more support from policymakers. Together, these two dynamics have created a perfect window of opportunity to act. Indeed, it may even represent a generational now-or-never moment to usher in a digital revolution within Canada's agriculture sector.

The report reveals a fragmented ecosystem where large operations thrive by adopting new tools and technologies, but smaller farms struggle, missing out on profitability and sustainability gains. Insights and recommendations from this report aim to elevate digital agriculture as a national priority. Five actionable steps should bridge adoption divides, equipping farmers for the future. The stakes are high, and the time to move is today.

Key Takeaways

- Current conversations about digital agriculture focus too much on the potential benefits of technology, not enough on farm-level realities. Shifting to practical challenges and payoffs can drive meaningful change.
- Digital agriculture tools available to producers today have been proven to boost productivity and competitiveness and reduce environmental impacts with the potential to unlock a further $750 million to $1.5 billion[1] in annual net revenue over the next decade.
- Adoption rates in Canada remain relatively low, leaving farmers behind global peers. Poor rural connectivity, unclear rates of return on investment, and distrust of the data stewardship policies are a few of the barriers that stall adoption.
- The Sustainable Canadian Agricultural Partnership ignored digital agriculture as an area of focus. The next FPT agriculture policy framework agreement should attach strategic importance to strengthening the adoption and effective use of digital technologies, especially given the rapid digitalization of the broader Canadian and global economies.
- Aging farmers, succession gaps, market pressures, and global trade uncertainty make this a now-or-never moment. The digital transformation of Canadian agriculture cannot wait forever.

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[1] These figures are not absolute values but an indication of the great potential, based on studies like the Farm Credit Canada report on productivity potential and the importance of digital agriculture as a driver, potentially contributing at least 25% to that growth, as supported by the Canadian Federation of Agriculture's 2024 report on data-driven sustainable productivity, which highlights how digital agriculture can increase yields by 10-20% and cut costs like water or fertilizer by 15-30%. Global trends, like McKinsey $100-150 billion AI potential worldwide, were considered as well, to ensure Canada's share makes sense.

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Reframing Canada's digital agriculture conversation

Digital agriculture offers powerful tools to address Canada's pressing agricultural challenges, but the current approach isn't delivering results. Despite the potential to increase yields by 20% while reducing environmental impact, Canada captures just 3% of global agtech venture capital investment compared to 55% in the United States. If this trend continues, it will mean fewer leading global agtech companies will be built in Canada. Fewer innovations will be created and adapted by Canadian farmers. In this scenario, Canadian farmers in the future will have poorer access to the tools they need to be profitable and sustainable and will be less competitive compared to their peers in more digitally advanced nations. Eventually, this could represent an emerging threat to a $150 billion sector that employs 2.3 million Canadians and exports $99 billion annually to over 200 countries.

Digital agriculture is more than precision tools like sensors and GPS-guided equipment. It's a broad ecosystem that includes software for farm management, robotic systems for daily tasks, and AI-driven insights for planning and profitability. These tools don't just boost yields. They save time, reduce stress, and strengthen farmers' control over their operations. Recognizing this full scope is key to unlocking its full potential across all farm types. A wider lens can ensure support reaches beyond the "flashy" tech to the practical solutions farmers need every day, from herd monitoring to market forecasting.

The digital transformation of Canadian agriculture is about more than just adopting new technologies; it's about reimagining the very nature of farming. As external pressures, including trade uncertainties, climate volatility, and rising production costs intensify, digital agriculture represents not merely an optional enhancement but a strategic necessity for maintaining competitiveness and resilience. As this revolution unfolds, ensuring that farms of all sizes and regions can benefit is crucial, bridging the digital divide to create a more sustainable, productive, and competitive agriculture sector for all of Canada.

But the reality is that adoption of these tools - which are often associated with precision agriculture in the grain industry but encompass all computer-related services that can improve farm operations - is proceeding unevenly. Moreover, much more could be done to ensure that a greater number of producers not just acquire these tools but also use them effectively. Indeed, even building a thriving agtech development sector will not guarantee there will be robust on-farm use of digital technologies. Without concerted action to change these conditions, Canada's agricultural sector could miss vital opportunities to raise its productivity, which is crucial to the country's overall prosperity.

According to estimates from Farm Credit Canada (FCC), Canada's agriculture sector could generate an additional $30 billion in net revenue over the next decade if it returns to annual productivity growth of 2% - levels last seen from 1991 to 2010. However, without collaborative effort, productivity gains will likely remain stagnant at around one percent until 2030. Digital agriculture offers a pathway to driving productivity growth, but only if the conversation shifts toward action. Policymakers and stakeholders must work together to enable more producers to gain access to emerging digital tools that provide cost-effective and sustainable ways to increase productivity on their farms.

Doing so will also be necessary to transform Canada's agriculture sector from an important - but often underappreciated - part of the economy to a true strategic asset within the broader, rapidly evolving and digitalizing global economy.

However, the current conversation around digital agriculture in Canada often reflects a disconnect between high-level policy objectives, agtech company goals and on-farm implementation challenges. While discussions frequently highlight the potential benefits to productivity, sustainability, and competitiveness, they tend to give less attention to the practical constraints farmers face in their daily operations, alongside their individual motivations. When farmers hesitate to adopt digital tools, it is often framed as resistance to innovation rather than coming from legitimate concerns about a range of issues, including internet connectivity, return on investment, and ease of use.

> "I always say that agriculture is going through the same existential crisis that energy did 15 years ago, right? Because energy didn't play very nice in the sandbox together for the longest time, because they didn't have to. I think agriculture is starting to recognize that if we don't come together and really figure out what we want to be talking about publicly and as a collective around where this sector is going and how it really has the opportunity to make a profound impact on the Canadian economy, well, then it's just going to get picked apart."
>
> *- Marlise Hunter, Tall Grass Ventures*

It's important to recognize that digital agriculture is not a one-size-fits-all solution. And perceived resistance to innovation is driven by real concerns. For example, technologies often enter the market before being fully refined, leading to hesitancy among producers who may have been disappointed by the real performance of much-hyped tools in the past.

The diversity of Canadian farming operations further complicates this picture, as digital solutions that work for large-scale grain producers in Saskatchewan may be irrelevant to smaller-scale horticulture farmers in Southern Ontario. Yet, policy approaches do not fully account for this variability.

Ultimately, there is a need for nuance around discussions about Canada's digital agriculture future. Rather than repeating broad assessments of the potential benefits of digital agriculture technology, this report examines the realities of on-farm adoption and how some of the barriers to adoption can be overcome. Based on the insights gained from stakeholder interviews, landscape analysis, and international comparisons, the report provides actionable policy recommendations to the government that we believe will serve to position digital agriculture as a national strategic priority.

> "Some stats from Stats Canada show that, you know, when it comes to adoption of technologies in agriculture, we're a laggard in terms of other parts of the Canadian economy. So you know, we need to create clarity. And we need to show the value to people very quickly. So groups like government, EMILI, FCC can sponsor, we can come together to create these ecosystems of seeing value."
>
> *- Craig Klemmer, Farm Credit Canada*

As we will argue throughout the report, the next decade presents an opportunity to drive the productivity and success of farms from coast to coast through their digital transformation. But this will require policy drivers that align with the needs of both farmers and the agtech industry.

The analysis and policy recommendations presented in this report will help policymakers, industry stakeholders, and farmers gain a clearer understanding of the state of on-farm digital technology adoption and provide policy options that could be implemented in the next five to ten years to help Canadian agriculture move through its digital transformation.

1. Current state of digital agriculture in Canada

Digital agriculture is transforming the way Canadian farmers work their land and manage their livestock. Popular conception often limits digital agriculture to recent breakthroughs in precision agriculture, such as embedded soil sensors and satellite-guided tractors. However, it extends far beyond precision agriculture. It includes software platforms that aid with accounting and human resources, cameras with computer-based visual recognition tools to monitor livestock herd safety, robotic milking machines on dairy farms, and much more. The benefits range from higher yields alongside reduced environmental impact to increased animal welfare and a better quality of life for producers by reducing physical and mental stress. Agriculture and Agri-Food Canada (AAFC) highlights tangible gains from digital tools, noting, "Farmers in Alberta reported a 15% reduction in fuel costs and a 10% increase in yields after using GPS systems…That's a pretty substantial impact just because of a fairly straightforward type of technology".

Artificial intelligence (AI) and machine-learning algorithms are also increasingly underpinning agtech products to assist producers with data analysis, leading to actionable insights. For example, AI systems are already used in greenhouses to fine-tune and automate the levels of light, water, and plant nutrition to maximize yield. Beyond this, smart irrigation systems leveraging sensors and AI have demonstrated significant gains in resource efficiency, with some farmers in water-stressed regions like Alberta achieving up to 30% reductions in water usage. AI software has also proven capable of predicting crop yields, detecting early signs of livestock disease, and even forecasting commodity market demands, allowing farmers to plan more effectively.

Indeed, the integration of AI in agriculture has progressed faster than anticipated. A June 2024 report by McKinsey & Company argues that the agriculture sector is poised for significant change through AI due to "its high volumes of unstructured data, significant reliance on labour, complex supply chain logistics, and long R&D cycles". This may eventually lead from the use of agriculture-focused chatbots to sophisticated AI agents powered by large language models (LLMs).

Overall, the adoption of new technologies within Canadian agriculture is marked by fragmentation. Pockets of excellence thrive alongside substantial gaps in uptake. Large operations in grain and oilseeds, greenhouses, and the dairy industry lead the way with strong adoption. In contrast, horticulture and smaller-scale farms lag behind, often missing out on these tools' potential — in part because there is less technology available on the market to serve this sub-sector.

> **"There is a tremendous amount of technology being developed for agriculture. But you are talking about an almost infinite number of permutations. There are very few ready-made, off-the-shelf packages of tools that are designed to make a potato farmer's life better, or a grain grower's life better. There are individual pieces, you know. There are platforms."**
>
> *- Donald Killorn, PEI Federation of Agriculture*

Canadian On Farm Technology Adoption

Legend:
- All farms
- Oilseed and grain
- Vegetable and melon
- Fruit and tree nut
- Greenhouse, nursery and floriculture
- Beef cattle and feedlots
- Dairy cattle and milk
- Hog and pig
- Poultry and egg

Categories: Farms reporting use of technologies | Auto-steer | Robotic Milking | GIS mapping (2016, 2021)
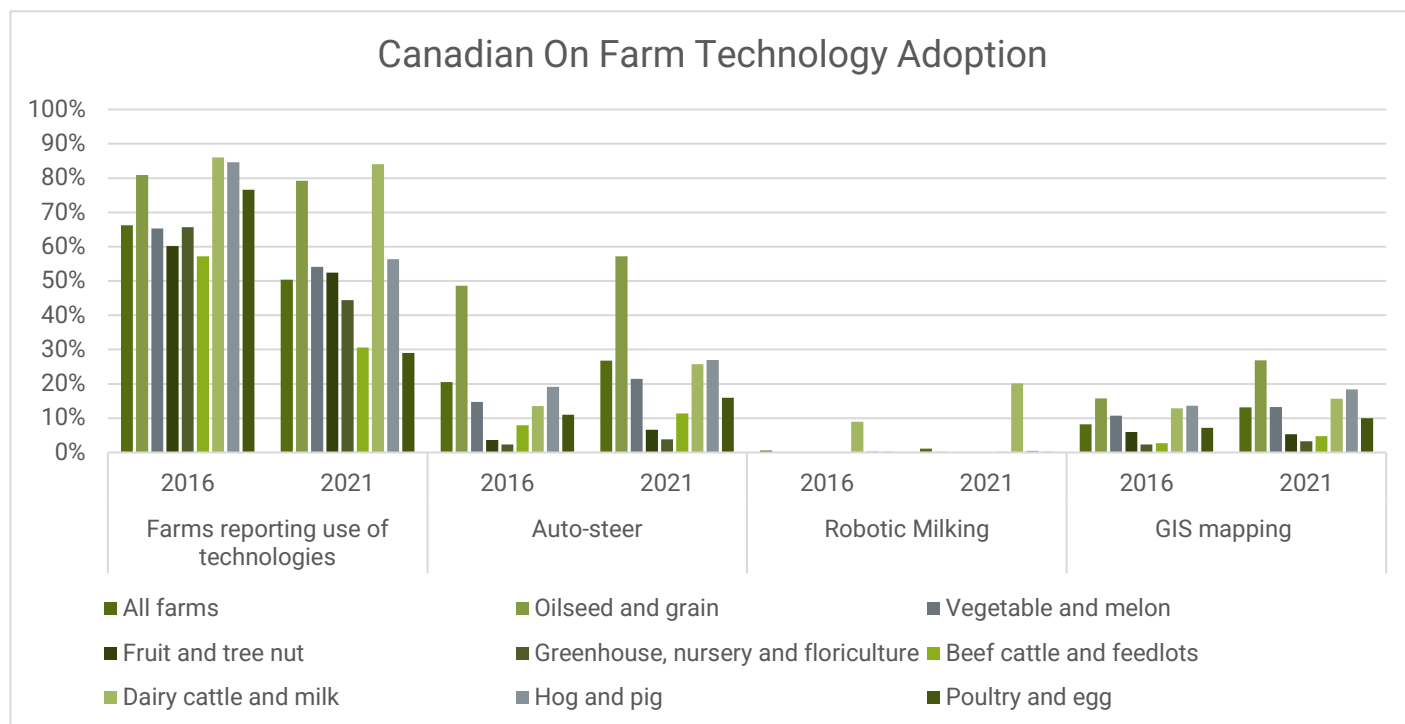
Sources: Enstroem, et al, 2023; Easher, et al, 2024

This is already creating three distinct problems. First, by not using the most advanced technology, some farms aren't achieving their full potential, thereby limiting their profitability and financial sustainability. Second, the uneven availability and use of digital technology within the sector is exacerbating the pre-existing inequity within the farming community. And third, at the macro-level, it is reducing the ability of Canadian farm products to compete in the global market - now and in the future. Especially as countries such as Australia, the Netherlands, and Israel implement comprehensive digital agriculture frameworks with clear governance structures and strategic roadmaps.

By comparison, Canada's approach to digital agriculture has been largely piecemeal, characterized by uncoordinated provincial initiatives and time-limited federal programs without a long-term vision. The goal of incentivizing the on-farm adoption of digital tools and technologies is not central to the Sustainable Canadian Agricultural Partnership (2023-2028). Nor is the development of agtech a significant focus of the federal government's innovation agenda and programs, including at the National Research Council Canada and Innovation, Science and Economic Development Canada (ISED). Worse, regulatory barriers further contribute to these shortcomings. Despite significant investments, there remain significant challenges to delivering cellular and broadband internet connectivity in rural areas, while unclear data ownership policies hinder farmers' trust in digital tools, leaving Canada trailing nations with sharper, more cohesive strategies.

1.1.   Key players in Canadian agtech

The Canadian digital agriculture ecosystem is a complex network of stakeholders, each playing a crucial role in the development, funding, support, and adoption of agtech innovations. This ecosystem has evolved significantly in recent years, with a diverse array of players contributing to its growth and transformation.

At the forefront of agtech innovation in Canada is a mix of established companies, startups, and research institutions. Large agricultural machinery firms like John Deere and BASF Digital Farming have a strong presence, leveraging their resources to develop precision agriculture solutions. Increasingly, this includes the integration of AI and machine learning into farming equipment.

BASF Digital Farming continues to expand its digital offerings, focusing on data-driven decision-making tools for farmers, while Bayer, through its Climate FieldView platform, helps farmers manage, monitor and optimize inputs such as seed treatments, herbicides and fungicides, while also maximizing yields and generating data that can be shared with agronomist advisors and other partners. Canadian companies include TELUS Agriculture & Consumer Goods which uses data insights to help their customers make more informed decisions that drive efficient production processes while improving safety, quality, and sustainability in food production. Precision AI is advancing artificial intelligence based farming practices, including the world's first AI agriculture drones for plant-level applications at broad-acre scale. Miraterra Soil is reimagining soil, plants, and food measurement by developing "molecular fingerprints" of soils and plants based on complex, mixed method testing. Ukko Agro, whose sensor-based adaptive modeling agronomy tool aggregates field risks and monitors crop growth stages, enabling farmers to better time their sales to customers. Meanwhile, SomaDetect offers software solutions for the dairy industry that can identify high-risk cows or flag pregnancy risks. As of early 2025, the company is planning to also release a product capable of tracking the fat and protein output of each individual cow within a given milking operation.

Innovation is evident within the startup space as well. Companies like Semios, which specializes in precision agriculture for tree fruit and nut orchards, and GrainFox, a farm wealth solutions platform, have emerged as leaders in the Canadian agtech landscape. AAFC is increasingly engaging with this ecosystem to support a more integrated, data-driven agtech landscape. In that spirit, AAFC recently supported a series of roundtables organized by Bioenterprise. These events brought together a diverse mix of startups and established companies, fostering dialogue on funding, regulatory, and technical challenges.

Other organizations are helping reshape the landscape and address critical needs within agriculture as well.

The Canadian Federation of Agriculture (CFA) released a white paper at the 2024 Agriculture Ministers FPT meeting that advocated for a new comprehensive policy and legislative framework to harness the benefits of advanced data analytics and precision farming. Key recommendations include creating a Pan-Canadian Data Strategy, investing in rural connectivity, and creating data standards - in part to support farm equipment interoperability. Standards development organizations, such as the CSA Group, Standards Council of Canada and International Organization for Standardization (ISO) have similarly begun engagement and exploratory work on agriculture data and technology initiatives.

Elsewhere, since 2022, EMILI, a nonprofit based in Manitoba, has worked in partnership with a local grain farmer to create Innovation Farms, located on a 5,500-acre commercial seed farm near Winnipeg. It provides a real-world setting for entrepreneurs and startups to test, validate and demonstrate cutting-edge farming tools. This helps startups and industries to de-risk the development of new technology while providing students, academics and policymakers with exposure to how these tools operate. EMILI is also spearheading the Canadian Agri-Food Data Initiative, which is focused on data literacy training programs and applied research to equip people working in the agri-food sector with the data governance skills they need to leverage digital technologies effectively. EMILI's initiatives are connected to the Pan-Canadian Smart Farm Network as well, which aims to create a unified platform for agtech development and testing across different regions.

Research institutions also play a vital role in digital technology development. The University of Saskatchewan's Global Institute for Food Security, for instance, is pioneering research in digital agriculture, while the University of Guelph's Food from Thought research program is advancing the use of big data in agriculture.

The venture funding ecosystem for Canadian agtech is multifaceted, involving crown corporations, venture capital firms, and corporate venture investors. Private sector venture capital firms such as Avrio Capital and iNovia Capital have been active in funding agtech startups. However, compared to other tech sectors, agtech in Canada faces challenges in attracting sufficient venture capital, particularly for early-stage companies. Meanwhile, accelerators and incubators like Bioenterprise and District Ventures play a vital role in nurturing early-stage agtech companies, offering mentorship, networking opportunities, and limited funding. Publicly funded organizations, such as the Canadian Agri-Food Automation and Intelligence Network (CAAIN) and Protein

Industries Canada, also push the sector forward by advocating for its needs and channeling funding toward collaborative projects between industry, academia, and government.

However, despite all this activity, Canadian agriculture struggles to keep pace with digital agriculture development and adoption. There's a need for better coordination and knowledge-sharing across provinces. There's a need to reduce overlap and duplication - particularly in data collection and information management systems - as well as difficulties scaling. Yet those issues are more rooted in product design and the nature of commercial activity. Many of these challenges were analyzed in a 2024 report from BioEnterprise, laying out a roadmap for making Canada an agri-food innovation superpower.

A more coordinated, coherent and significant effort and investment will be necessary to fully realize the potential of digital agriculture in Canada and position the country as a leader in addressing the sustainability challenges facing the industry.

1.2.   Adoption trends across Canada

In 2025, digital tools are transforming agriculture, but their adoption varies across different farm sizes, regions, and crop types. Basic technologies like GPS are common among crop producers in Central and Western Canada, while more advanced technologies, such as robotics, big data, and remote sensing, have seen more limited adoption overall. In provinces like Ontario, larger farms are benefiting from tools like crop management software, which combines field mapping and pest monitoring, leading to efficiency gains and yield increases of about 15%.

Large farms, particularly those with over 5,000 acres, are more likely to bring new technology into their operation, with 81% either using or planning to use at least one digital agriculture tool. Medium-sized farms (2,000 to 5,000 acres) follow closely at 76%, while smaller farms relative to the national average (under 2,000 acres) lag significantly at 36%. Precision agriculture tools, such as GPS-guided equipment, variable rate nutrient application, and yield mapping, have seen steady growth, particularly among larger farms. For instance, a 2021 survey by Agriculture and Agri-Food Canada found that 64% of farms with annual revenues exceeding $1 million reported using precision agriculture technologies, compared to only 24% of farms with revenues under $100,000.

These precision tools have shown significant potential to optimize resource use and boost efficiency. Variable rate technology allows targeted fertilizer application based on soil and topography differences, reducing input costs and improving yields. Additionally, sensors and data analytics provide real-time insights into crop health and equipment performance, enhancing decision-making. Beyond crop production, digital tools like cow cameras are improving livestock operations by reducing labor demands during calving season. These advancements collectively contribute to higher yields, reduced environmental impact, and improved quality of life for producers.

> **"We found that the flexibility of having an Elmer's Manufacturing portable grain bin in-field during corn harvest at Innovation Farms reduced staffing needs from 5 people to 3, when compared to a very similar field from the year prior. And what we discovered using John Deere Operations Centre technology was that by having the portable grain bin on site also minimized our combine idle time from 15% in 2023, which was about 4 hours of idling time, to 5% in 2024, which was less than an hour. Grain cart idle time was also reduced from 32% in 2023 to 25% in 2024. So we saw a lot more efficiencies with equipment beyond the combine itself. It was really fantastic to see tangible results of fuel and time efficiencies from the technology tracking it in the field."**
>
> *- Leanne Koroscil, Enterprise Machine Intelligence and Learning Initiative (EMILI)*

Moreover, a survey of 852 Canadian producers published in November 2024 revealed that while a large majority of respondents agree that digitalization can improve the quality of work on farms while enhancing productivity and profitability, there are underlying variations in perspectives. Farms larger in size than the national average were more likely to agree that digitalization improves the quality of on-farm work. Farmers with higher education levels were much more likely to perceive digital innovations as more reliable than other technologies. This

disparity in adoption rates highlights the need for targeted support and policies to ensure that farms of various sizes can benefit from technological advancements in ways suitable to their operations.

Regional differences in the use of digital technology are also apparent. Adoption rates and the types of technologies used vary considerably across provinces, reflecting differences in farming practices, crop types, and local challenges. This variability underscores the need for regionally tailored technology development and adoption programs to address specific needs and growing conditions.

Adoption patterns also show a large variance across agricultural sectors, reflecting different production systems and operational needs. For instance, dairy operations have increasingly adopted robotic milking systems and genomics-based breeding decisions. This has reduced labour requirements, while at the same time changing the nature of workforce skills needed. In contrast, the beef cattle industry generally shows lower digitalization rates.

Although this is outside the scope of this report, uneven on-farm technology adoption also creates challenges for Canadian agtech companies and startups. Bringing innovations to market is always a challenge - and this is especially true in specialized industries like agriculture. Without strong customer uptake of a new product or service it can be difficult for startups to scale up. Uncertain customer demand adds to existing challenges facing agtech companies including a difficult venture capital environment and complex regulatory compliance.

1.3. Government initiatives and support

The Government of Canada, recognizing the potential of digital agriculture, has implemented some programs to support its adoption. However, federal initiatives lack a strategy or vision to bring policy coherence, a significant challenge given the vast and dynamic set of issues around digital agriculture.

Federal efforts to advance digital agriculture include significant investments in internet connectivity. The Universal Broadband Fund, with over $2.3 billion committed, aims to connect 98% of Canadians to high-speed wired internet by 2026 and all Canadians by 2030, including rural areas where most agricultural production occurs. Yet, many farmers, particularly those operating in remote areas, still struggle to get reliable high-speed internet access. These challenges vary across different regions of Canada. However, even in more densely populated provinces like Ontario, farmers just 20 minutes outside of major cities report significant internet connectivity problems. As of 2025, only 78.5% of rural Canadians had access to high-speed internet, with 90% of farmers residing in underserved areas.

Provinces have also contributed to digital innovation through their own programs and policies, given that agriculture is an area of shared federal-provincial responsibility. And while these initiatives have indeed made strides in supporting farmers' adoption of new tools, they need to increase in both scale and ambition if Canada is to achieve enduring productivity gains.

The Sustainable Canadian Agricultural Partnership (S-CAP) is the main programming suite for the agriculture sector in Canada. Launched in 2023, it is the latest in a series of successive five-year program agreements. The agreement includes business risk management (BRM) programs and non-BRM spending. The non-BRM envelope is a $3.5 billion/five-year framework that includes $1 billion in federally delivered, federal-only programs and $2.5 billion in cost-shared programs funded through a 60/40 federal-provincial cost-sharing model.

Priorities for the policy framework agreement are set through a consensus process of federal and provincial governments. In the S-CAP, they are building sector capacity, growth and competitiveness, climate change and environment, science, research and innovation, market development and trade and resiliency and public trust.

Innovation-related federal-only programs include AgriScience (supporting pre-commercial scientific research activities) and AgriInnovate (funding the commercialization and the adoption of new technologies). AgriInnovate offers up to $5 million in repayable contributions per project, which could potentially fund digital agriculture projects. However, the program's repayable, cost-shared financing may not offer the right type or the sufficient level of support needed to drive the broad adoption of digital agriculture technology on-farm. Further, the AgriInnovate program lacks focus and is not aligned with a broader innovation or technology adoption strategy for the Canadian agriculture sector.

Provincially designed and delivered cost-shared programs (60/40 federal-provincial funding) are a key part of the S-CAP framework. Across Canada, there are a variety of provincial programs that support digital agriculture. For example, the B.C. On-Farm Technology Adoption Program provides up to $150,000 per project to help farmers purchase and install new technologies.

We also find examples where provincial cost-shared programs fund digital agriculture projects, even if the program itself has broader objectives. For example, Alberta provided the Simpson Centre at the University of Calgary with $1.2 million under the province's Alberta Digitalization Agriculture (ABDIAG) program and the Manitoba Government invested $2.025 million in EMILI's Innovation farms initiative to advance digital agriculture opportunities.

All these examples are delivered through provincial governments but with a combination of federal and provincial funding.

> "At Innovation Farms, we demonstrate digital agriculture technologies and lead advancements on a real operating Manitoban farm. This provides academia, innovators, industry leaders and entrepreneurs with access to leading edge equipment, technology and production practices on a commercial 5,500 acre farm while ultimately de-risking technology adoption for producers. Having access to initiatives and programs like Innovation Farms provides the industry with tangible tools and skills to make informed decisions about data and technology for the future of agriculture. Greater support is still needed to equip current and future workers with the tools and knowledge they need to thrive in a rapidly evolving industry."
>
> *- Leanne Koroscil, Enterprise Machine Intelligence and Learning Initiative (EMILI)*

While the S-CAP agreement is the primary source of public funding in agriculture, with an annual budget of just $500 million for non-BRM programs, the funding envelope is not large enough to catalyze deep, sector-wide change, let alone deliver on the breadth of government priorities found in the agreement. The provincial cost-shared programs are a good example of that reality. With limited budgets and a lack of awareness among farmers, many producers do not benefit from public support that could support the adoption of new digital technologies.

Outside the S-CAP FPT agreement, there is also AAFC's Agricultural Clean Technology (ACT) program. Created in 2023 with a $165 million budget, it provides non-repayable contributions ranging from $25,000 to $2 million, covering up to 50% of eligible costs for projects like precision agriculture. Despite its popularity, leading to oversubscription in most years, its effectiveness as a tool to drive digital adoption has been limited. It does not prioritize digital solutions, and the application process can be complex and time-consuming for farmers. The program's focus on clean technology does not always align with the priorities of farmers, particularly those struggling with basic infrastructure issues.

Other federal departments also fund initiatives with a digital agriculture component. The Canadian Agri-Food Automation and Intelligence Network (CAAIN) and Protein Industries Canada (PIC) are funded by ISED and fund collaborations between industry, academia, and government, including some projects that focus on digital solutions. ISED also runs other general-purpose programs, including the Accessible Technology Program, the Canada Digital Adoption Program (ended in 2024) and the Clean Growth Hub.

Canada's mix of federal and provincial programs is not sufficient to drive a digital revolution in Canadian agriculture. At present, government programs are too complex and unfocused to make an impact on the technology adoption decisions of Canadian farmers and the technology options available in the agtech marketplace. In an era of tightening budgets, program design and delivery are increasingly important, and the current approach may not be maximizing impact.

2. Breaking down barriers to technology adoption

Farmers don't make decisions about adopting new technologies in a vacuum. They are strategic business owners juggling short-term needs with long-term goals, dealing with external pressures like market fluctuations, adverse weather conditions and strategic challenges like climate change, all while trying to maintain their livelihoods.

The choice to embrace digital agriculture tools is just one of many complex decisions farmers face in running their operations.

When it comes to digital technology adoption specifically, research shows that farmers go through a process that involves gaining knowledge about a new tool, being persuaded of its value, making a decision, implementing the new tool, and then confirming its usefulness. At each of these stages, various barriers can crop up that affect whether a farmer ultimately adopts the technology. These obstacles, ranging from financial challenges to skills gaps, represent critical areas where targeted policy interventions could accelerate the uptake of innovative technologies and farming practices.

Table 1: Barriers preventing more producers from adopting precision agriculture

Barrier	% of Respondents who agree or strongly agree		
	Prairies	Ontario	USA Midwest
My farmers are interested in precision services, but pressure on farm income in my area limits their use	72%[1]	53%[1]	78%[1]
The cost of precision services to my customers is greater than the benefits many receive	42%[2]	44%[2]	48%[2]
Customers lack confidence in the agronomic recommendations made based on site-specific data (e.g., yield maps, GPS soil sampling, remote sensing)	38%[3]	29%[3]	37%[3]
Interpreting and making decisions with precision agricultural information takes too much of my customer's time	36%[4]	21%[5]	28%[5]
Customer concerns with data privacy limit their participation	32%[5]	26%[4]	27%[6]
Soil types in my area limit the profitability of precision agricultural practices for my customers	26%[6]	15%[7]	30%[4]
The topography (i.e., rolling ground, etc.) in my area limits use of precision services by farmers	22%[7]	18%[6]	21%[7]

Source: Department of Food, Agricultural and Resource Economics, University of Guelph

2.1. Financial challenges

The financial challenge associated with purchasing and implementing new technology has evolved over the years, but it is particularly acute in periods of economic uncertainty and reduced farm profitability. And after two years of strong revenues in 2022 and 2023, the sector faced a downturn, with net farm income projected to have fallen by 4.4% in 2024. This decline in profitability has made it increasingly difficult for farmers to allocate funds for new technologies.

Indeed, the high upfront costs associated with advanced machinery, digital devices and agtech software can outweigh the perceived benefits for many farmers, particularly those operating smaller acreages.

Adding to these financial pressures are the ongoing costs associated with digital agriculture solutions. Many agtech tools require subscription fees or additional expenses for data storage, software updates, and analytics services. These recurring costs can strain farm budgets, particularly when the tangible benefits of the technology are not immediately apparent or easily quantifiable.

Usage-based models (e.g., $/per acre, $/per module/per acre) are becoming increasingly common, with prices ranging from as low as $1 an acre to as high as $60 an acre. However, even products in the lower per-acre price range have struggled to gain commercial success, indicating that cost remains a significant barrier for farmers.

2.2.   Internet Connectivity

The lack of reliable, high-speed wired and wireless internet connectivity to the farmyard, farm office, barn and in the field hinders the use of advanced digital farming technologies, especially in rural areas. This gap especially limits the adoption and effectiveness of technologies that rely on real-time transmission of large data sets, including shape files and cloud-based services. It also hampers the operation of Internet of Things (IoT), GPS-guided machinery and sensor networks crucial for monitoring crop health, soil conditions, and equipment performance. In the absence of reliabile connectivity, producers must manually collect data from equipment by using USB sticks or other portable hard drives.

Repairs can also sometimes require a technician to remotely access a piece of equipment to run diagnostic tools. To help overcome this challenge in low-connectivity areas, some technology providers have started exploring the possibility of integrating low-earth orbit solutions like Starlink and or Telesat; however, these remain in their infancy for in-field use. For example, in early 2024, John Deere announced a strategic partnership with SpaceX to provide connectivity to its customers in rural areas.

> **"One unfortunate thing that could slow adoption of agtech products and cause problems in the future is that producers - especially those living in very rural areas - will struggle to get technicians to service their agtech equipment on short notice. Connectivity matters even more then, because it makes a huge difference if technicians are able to remotely troubleshoot issues. You know, in the case of robotics, if the motherboard goes down, a farm operation can't wait two weeks to get a new one delivered."**
>
> *- Craig Klemmer, Farm Credit Canada*

2.3.   Data Governance

Farmers are hesitant to adopt digital tools when they're unsure about how their data will be used or protected – in other words, the data ownership and data privacy practices of agtech companies are an important component of farmer decision making about agtech tools. Beyond data governance concerns, farmers also have questions about the fairness of the business models associated with digital agriculture technology. Some farmers feel that they are not adequately compensated for the value their data generates for agtech companies. Albeit the situation is complex: Aggregated datasets are valuable for technology companies, yet individual farm data holds limited value on its own. However, this doesn't diminish the perception among parts of the farming community that value doesn't always flow back to the producers who generate farm data in the first place.

Data ownership

When farmers use digital agriculture tools, they often upload significant information about their farming operations, including crop yields and soil conditions, to the agtech company systems. This raises questions about data management and ownership. Producers are protective of their data, wary of sharing it with equipment manufacturers or farm product buyers, like grain companies who may farm data for sustainability claims or market advantage. This reluctance often stems from a perceived power imbalance, where farmers feel at the mercy of larger entities in the agri-food value chain despite the on-farm operational benefits associated with digital tools.

"Data collection has made the grower relationship with industry a lot more professional, as the grower can calculate exactly what is required from their suppliers. Growers will continue to graduate towards better software as it continues to provide better insights, which also increases the need for increased security surrounding their digital property. There's an ongoing conversation around consumer trust with how food is produced, but I believe this trust is being renewed because growers can now prove their environmental footprint is socially sound and not impacting consumers in a negative way. Margins are tight in agriculture, so inputs need to be handled efficiently which is why increasing digital adoption and governance in Ag is so important."

- Martin White, Enns Bros.

"When it comes to crop marketing data, on so many occasions, we've heard concerns that data is being used against them or cutting into their farms profitability, or, you know, organizations not being truthful about their data practices. And hence why, a lot of farmers may just want to continue using spreadsheets or notebooks, despite the many drawbacks that come with that, such as not being able to collaborate or communicate with trusted advisors, which kind of reduces that I guess efficiency and profitability."

- Researcher for Canadian agtech company

This challenge is made worse by the agreements used by many agtech companies, which can be difficult for non-lawyers to read and understand. These data use agreements are often long and filled with legal jargon. In this situation, it is understandable that farmers often feel that agtech companies are not being transparent with them about their data management practices.

For instance, equipment companies may use sensors on equipment to collect detailed farm data, such as soil conditions and yield metrics, improve their services and products. While many companies state that farmers own their data and can opt out of sharing; many farmers remain uncertain whether their data is shared, or sold, to third parties like seed or fertilizer suppliers. Similarly, despite assurances of confidentiality, producers are concerned that sharing farm data with the government to support policy development or scientific research could inadvertently lead to its use for regulatory compliance, such as environmental audits.
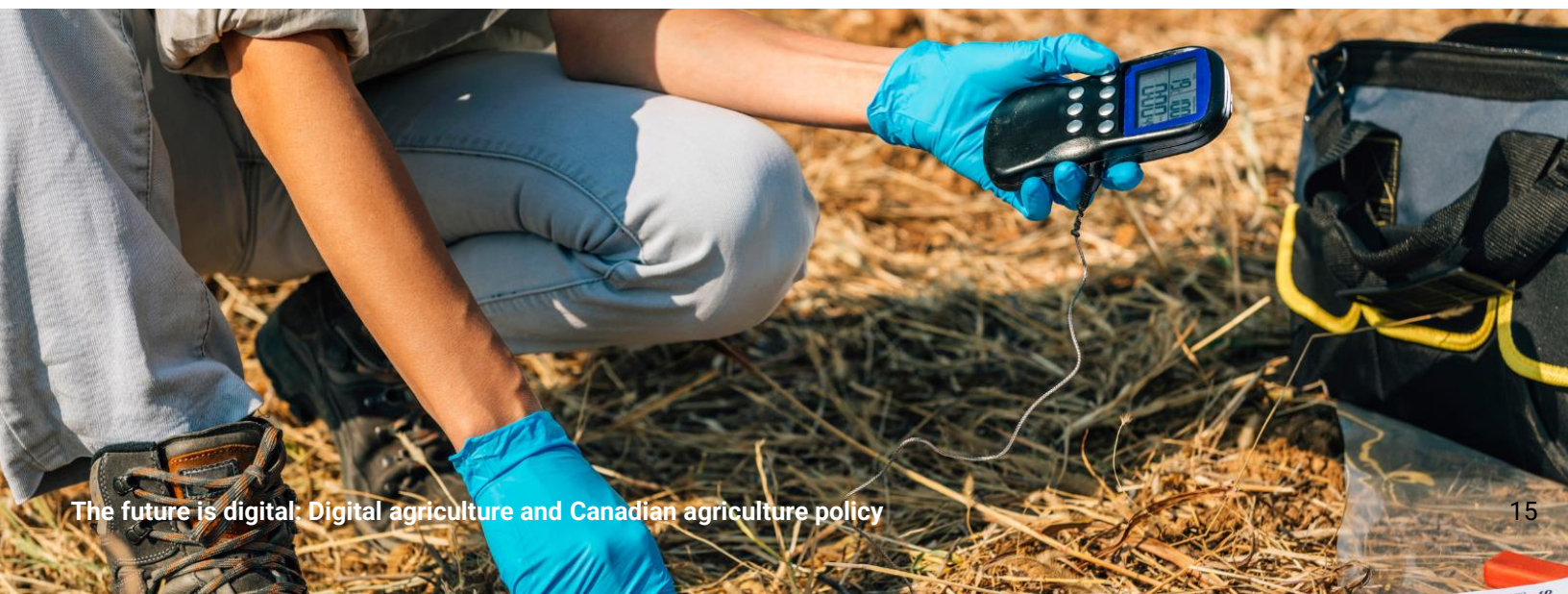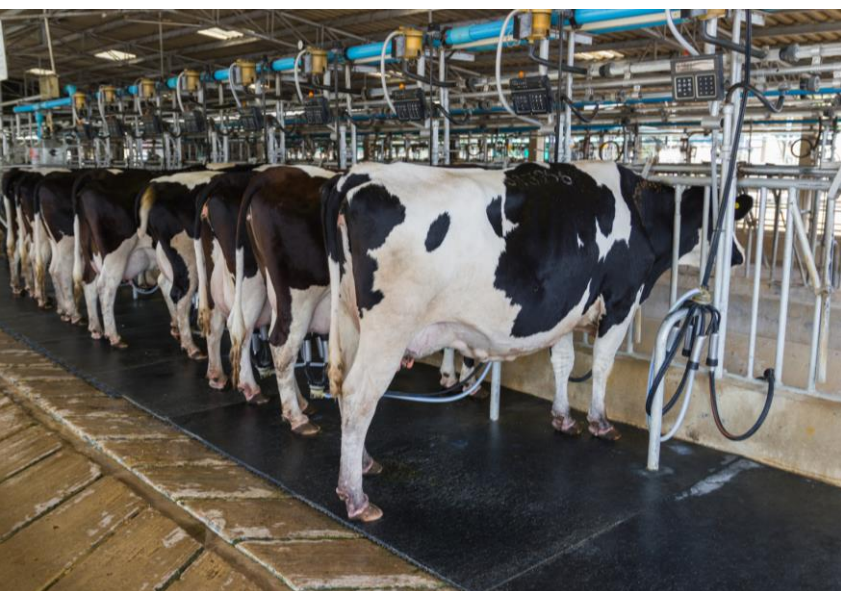
Data Privacy

Data privacy concerns are also a barrier to the adoption of digital tools in Canadian agriculture, with farmers expressing unease about how both agtech companies and the government protect their data. Although it is not often well understood, Canada's existing privacy laws, such as the Personal Information Protection and Electronic Documents Act (PIPEDA), are focused on personally identifiable data.

This means that most agricultural data, like yield or soil health data, is not governed by existing privacy legislation. This gap in legislation, combined with limited awareness of its scope, fuels hesitation among farmers, slowing the uptake of digital agriculture technologies.

"We're actually used to information sharing. We share a lot of information already. When it stays within smaller companies we trust that have worked in our industry for years and years, we know what they're doing with the data. I think for sure we have no problem sharing data in that situation. But I think when it comes to those big corporations that we're not sure exactly what they're doing. Then there is hesitancy to adopt some new technologies where you're not 100% sure who will see that data and what they may do with it."

- Connie McLellan, Dairy Farmers of Canada

Interoperability

The absence of clear data standards complicates data portability and interoperability, often preventing farmers from moving their data seamlessly between platforms. Left unaddressed, this lack of interoperability could be a major barrier to fully realizing the digital transformation of farming operations and the digital integration of the agri-food value chain. Poor interoperability increases friction for producers using digital technology in their farming operations and reduces the motivation for further technology adoption.

Without standardized protocols, farmers may also become dependent on specific technology providers, limiting their ability to switch services or access alternative solutions. The lack of data standards also leads agtech companies to create proprietary systems, driving up costs for both developers and end-users as custom integrations and interfaces are often required.

"Something that always comes to the forefront of discussions for farmers is silos, and I mean, not like a grain silo, but data silos. And it always comes up from the frustration of having to input data over and over again into a variety of different tools that they use, or tools not communicating with each other, or data getting stuck because it can't be exported."

– Researcher for Canadian agtech company

2.4.   Technology Efficacy

Farmers often question whether digital agriculture tools will perform reliably under real-world conditions and deliver the promised benefits.

This scepticism stems from several factors:

- Reliability concerns: Technologies that fail during crucial periods like planting or harvesting can have devastating consequences for farm operations.

- Accuracy issues: Farmers need confidence that tools such as AI-powered decision support systems provide precise and actionable insights tailored to their specific needs.

- User-friendliness: Complicated interfaces or frequent technical glitches can erode trust in digital solutions.

- Proven results: Farmers want concrete evidence of success before committing to new tools. Without visible proof of benefits, such as increased yields or cost savings, they remain hesitant.

"I've heard from some farmers who have tried certain digital tools and found that they don't always live up to the hype. For example, some precision agriculture tools might not be as accurate as advertised, or there might be issues with connectivity in rural areas. So, it's important to do your research and make sure that the technology you're investing in is reliable and will work for your specific needs. There also needs to be adequate support and extension workers available to help farmers make the transition to digital tools."

- *Connie McLellan, Dairy Farmers of Canada*

"They have 40 chances to try some new things, because the risk to try and tech is quite high on a year to year basis, and you only have 40 chances to get it right. So it's hard for farmers to adopt something new or unproven in that sense. So even if they're excited about the tech and want to support it, it's hard for them to justify all that financial risk in the real world."

- *Researcher for Canadian agtech company*

2.5.   Skills gap

The rapid pace of innovation in agriculture is outstripping the sector's ability to train and prepare its workforce or for many farm owner-operators to upskill themselves. While automation, robotics, and data-driven tools promise to transform farming, their full potential often remains unrealized due to a lack of workers with the necessary technical expertise - both on and off the farm. Farmers highlight a shift in labor needs, with one observing, "The demand for skills are different...it's more the maintenance and repairs" where bottlenecks occur, as general maintenance skills no longer suffice for digitized equipment. Workers often struggle with troubleshooting new technology, and family operations can come to rely on a few tech-savvy individuals, limiting scalability. Addressing this gap requires enhanced outreach and education, a priority echoed by AAFC, who see organizations like EMILI as essential for knowledge transfer. By connecting farmers directly with the practical applications of digital tools, it is possible to bridge the disconnect between technology developers and producers, ensuring innovations are understood and adopted effectively.

The nature of the skills gap

The agricultural workforce in Canada has traditionally relied on practical knowledge passed down through generations within farming families. However, the increasing integration of digital tools, including AI, internet-of-things (IoT) devices, drones, and precision agriculture machinery, has shifted the skills required for modern farming. Farmers and other workers in the agriculture sector now need competencies in areas such as data analysis, information management systems - such as project management software - and data literacy. Such skills are not typically part of traditional agricultural training. There is also a lack of job-specific professionals and trusted advisors with knowledge of digital agriculture technology, such as agronomists, technical service providers and technicians to maintain, service, and otherwise work with advanced farm equipment.

> **"Data literacy can be a challenge on the farm, especially with the rapid arrival of new technology, combined with different skill sets and backgrounds of workers on farming operations. Additionally, not everybody may understand the importance of data collection, have time to prioritize it, or know how to optimize data collection and use it to their advantage. Having a general awareness of the types of data currently existing on your farm and what other types might fit your operation can help make highly informed management decisions and help you understand how the data can be used to your benefit."**
>
> *- Leanne Koroscil, Enterprise Machine Intelligence and Learning Initiative (EMILI)*

This mismatch is further compounded by demographic challenges. The agriculture sector faces a wave of retirements, with nearly 30% of its workforce expected to leave within the next decade. Meanwhile, many younger workers are drawn to jobs based in urban areas, leaving rural areas struggling to attract talent. However, an increasingly technological agriculture sector that draws the interest of younger workers can be a partial response to this demographic challenge, not just on-farm but in rural communities more generally.

Training and education challenges

Agricultural education programs in post-secondary institutions today often lag industry needs, focusing on conventional farming techniques rather than emerging technologies. This disconnect can leave graduates ill-prepared for roles in digital agriculture. However, there are several innovative programs now in place at schools such as Olds College and Lakeland College in Alberta, Assiniboine College in Manitoba, and the Ontario Agricultural College, among others, that are pioneering new approaches. Furthermore, online courses and micro-credential initiatives have begun addressing this gap - albeit with the caveat that they require fast and reliable internet connectivity. For example, programs like Palette Skills' Digital Agriculture Fundamentals aim to provide hands-on training in technologies such as GIS, robotics, and AI. However, these types of initiatives are still limited in scale and availability. Anecdotally, many farmers are also reluctant to invest time and money into training without clear evidence of immediate benefits or returns on investment.

Knowledge and translation issues

Another challenge is the disconnect between researchers, technology developers, and farmers. Many innovations fail to reach widespread adoption because farmers do not fully understand their practical applications or benefits. The language used by researchers and developers often feels abstract or complex, making it difficult for farmers to see how these tools can be integrated into their operations. In this spirit, researchers developing farm-based solutions should keep it top of mind that farmers themselves are a core audience for their output.

2.6.   Return on Investment (ROI)

To be useful on a working farm, digital agriculture technologies must deliver measurable benefits in productivity, profitability, cost savings, and sustainability. However, uncertainty timelines around return on investment (ROI - especially the length of the payback period - reduces the incentive to invest in new tools. In a recent global survey of farmers, 30% of producers surveyed cite an unclear ROI as a top barrier to adoption.

Long return on investment timelines

As a rule of thumb, farmers typically expect a payback of three times their upfront capital investment in a reasonable time frame before committing to a new technology or tool. Yet when it comes to digital agriculture, the time required to see a return varies significantly depending on the farm's readiness to integrate the new technology into its ongoing operations. Farms with existing digital infrastructure and some historical data are more likely to see quick returns. Conversely, farms that are new to digital agriculture face longer timelines as they must first build foundational systems and gather initial datasets.

> "Growers will zone apply inputs or make fungicide/top dress decisions based on sound information.
> For example, by the 4th year, the same crop is back in rotation, and after harvest of that crop, the grower can calculate ROI. Was it through increased yield, or maybe from increased revenue because of decisions on inputs that may have been pulled back on some of the areas that didn't produce for that crop in the past. But that was still a leap of faith in digital investment on day one because it took 3-4 years to prove ROI. So, any government program cannot be a 1 or 2-year program. It has to be a long-term agenda to get to that ROI, and in my mind it has to be at least 4-5 years."
>
> *- Martin White, Enns Bros.*

While some tools like agricultural drones can yield returns within 6–12 months, others, like automated farm equipment, may take up to 48 months to deliver results. This is further complicated by the natural variation due to changes in weather and market fluctuations, which can make it even more challenging to measure the ROI of an agtech tool or service. This inherent variability creates uncertainty for farmers, particularly for those operating on tight budgets, more typical of smaller farms. For many farmers, uncertainty outweighs the potential long-term benefits. This disconnect has led to uneven adoption rates: simpler tools with immediate benefits see higher uptake, while more complex systems requiring significant investment are more often bypassed.

> "I think increasingly, commercially operational smart farms and the infrastructure around those are a potential great opportunity for that information to be shared, and also for farmers to almost participate in the development of the information and see the return on investment. Farmers will adopt things if they can see it first-hand — and see that a model works."
>
> *- Brett Maxwell, Agriculture and Agri-Food Canada*

The bottom line vs. perceived value

Farmers are pragmatic decision-makers who prioritize technologies that improve their bottom line. While innovations like smart irrigation systems or satellite imagery tools can provide productivity boosts and cost savings, many farmers feel that the benefits of digital agriculture are often framed in abstract terms rather than concrete, relatable financial metrics. For example, while sustainability improvements are important, they do not always translate into immediate economic advantages for farm businesses. Yet, government and agtech companies often promote digital agriculture tools based on non-financial outcomes like climate action. This misalignment between perceived value and actual financial payoff further dampens the enthusiasm for adopting new digital technology.

> "I think it's important to show farmers the direct benefits in terms of cost savings or increased productivity. For example, if a digital tool can help them reduce their input costs or increase their yields, that's going to be a big selling point. Sustainability is important, but it's often seen as a long-term benefit, whereas farmers need to see immediate returns on their investment."
>
> *- Connie McLellan, Dairy Farmers of Canada*

Farmers' awareness and readiness for change

Farmers face challenges in adopting digital agriculture due to numerous practical, cultural, and time-related factors. Agriculture is an industry with deeply held traditions, and traditional practices form the backbone of the knowledge that is passed down between generations within farming families. At the same time, digital tools represent new areas of expertise for farmers and, therefore, require focused capacity building in the farm community. The fast pace of technological change can also, in some cases, overwhelm farmers. Many are already pressed for time, and the constant flux of new tools and software can create . This leads some to prioritize proven methods over new ones in this time crunch. Further, limited access to relatable examples of successful agtech tool adoption hinders awareness in this time crunch.

> "I think there's a mix. We have some farmers who are very tech-savvy and are early adopters, and they're already using a lot of these digital tools. But then we have others who are maybe more traditional and are a bit wary of new technology. I think it's important to meet farmers where they're at and provide them with the information and support they need to make informed decisions about whether or not to adopt these technologies."
>
> *- Connie McLellan, Dairy Farmers of Canada*

Farmers value clear evidence of benefits before making changes. They are looking for relevant local demonstrations of new agtech tools and targeted support resources to build knowledge and capacity.

3. Best practices from peer countries

To strengthen Canada's digital agriculture ecosystem, examining how peer countries structure their public policies can reveal practical strategies worth considering. By analyzing the United States, Australia, the Netherlands, France, and the United Kingdom through four key areas - national strategy design, funding models, connectivity infrastructure, and data governance - adaptable practices that align with Canada's unique agricultural landscape have been identified.

3.1. United States: Structured public-private collaboration

The U.S. digital agriculture framework operates on a *partnership-dependent* model, where federal funding explicitly requires collaboration between private innovators, academic institutions, and rural communities. For example, the USDA's Small Business Innovation Research and Technology Transfer Programs (SBIR/STTR) program mandates that grant recipients partner with universities or rural communities, ensuring new technologies address tangible farm challenges. Examples of other USDA investments and support include low-interest loans for precision agriculture equipment, Conservation Innovation Grants (CIG) ($15 million in 2024 for soil health tools) and $1.5 billion invested in agricultural research through its Agricultural Research Service (ARS), focusing on advancing conservation and climate-smart agriculture.

Connectivity is prioritized through the ReConnect Program, which funds broadband deployment in underserved rural areas via loans and grants to Indigenous groups, local governments, and corporations. By 2023, the program aimed to allocate $4.78 billion to serve 449,000 rural locations, including homes, farms, and businesses.

Data governance under the USDA's 2024 Data Strategy emphasizes secure sharing of anonymized farm data for sector-wide AI analysis while maintaining individual privacy. Farmers retain ownership of data collected through USDA-supported technologies, with strict penalties for unauthorized third-party use. U.S. farm groups and agtech companies have also created the Ag Data Transparent organization which helps farmers better understand the content of agtech contracts and farm data use agreements. Ag Data Transparent builds off the 2014 American Farm Bureau's privacy and security principles for farm data.

Best practice to consider

Introduce more meaningful partnership requirements in federal and provincial programs (e.g., AgriInnovate) that mirror the U.S. SBIR model, where collaboration is mandatory, ensuring farmer involvement in technology co-development. This helps address the challenge of translating lab innovations to farming applications.

3.2. Australia: Flexible federal-provincial coordination

Australia's Digital Foundations for Agriculture Strategy (2022) sets a national target of $100 billion AUD in total farm gate revenue by 2030. This is a national target, but it also includes flexibility to allow Australian states to tailor their initiatives to local needs. For example, Victoria's Digital Agriculture Investment Scheme funds state-specific solutions like drought-resistant irrigation, while the federal On-Farm Connectivity Program offers 50% rebates (up to AUD$30K) for IoT sensor installations.

Funding for agriculture research and innovation in Australia totals approximately $800 million AUD per year, channelled through Rural R&D Corporations - Crown corporations - with $300 million AUD coming from government investment and the rest sourced from industry levies matching industry levies dollar-for-dollar. This funding supports projects ranging from drought-resistant crops to farm automation. Separately, AUD$30 million was allocated in 2022 to establish the National Centre for Digital Agriculture, which coordinates data standards and AI adoption across the sector.

The $302 million AUD Climate-Smart Agriculture Program (2023–2027) includes a stream, allocating $45 million AUD over four years toward open-competition grants for medium to large-scale projects to drive the adoption of innovative new tools for reducing emissions.

Connectivity infrastructure in Australia is bolstered by the Regional Tech Hub, which provides free advisory services to farmers on equipment setup and connectivity solutions. As of June 2023, the Hub has assisted over 140,000 rural Australians with connectivity challenges, including personalized support for accessing rebates under the On-Farm Connectivity Program.

Best practice to consider

Move beyond the existing cost-sharing model to unify cost-shared provincial programs related to digital agriculture like Alberta's Digitalization Agriculture (ABDIAG) and B.C.'s On-Farm Technology Adoption Program under a common national strategy.

3.3. Netherlands: Extension to support digital adoption

The Netherlands embeds digital agriculture into its EU Common Agricultural Policy (CAP) funding through its CAP Strategic Plan. The government provides financial incentives for farmers who participate in innovation training. Building on the theme of extension, governments support the Platform for Helping small and medium farmers to Incorporate digital Technology for equal Opportunities (PHITO) project.

The Netherlands also supports a thriving ag tech ecosystem through the identification of agri-food as a "Top Sector." The Knowledge and Innovation Agenda includes an innovation programme focused on smart technologies.

Connectivity infrastructure in the Netherlands is robust, with 98% of rural areas covered by high-speed internet, enabling real-time IoT data transmission. The Dutch government partners with telecom providers to prioritize 5G connectivity in agricultural zones.

As a member of the European Union, agricultural data governance in the Netherlands is enhanced by sectoral agreements like the EU Code of Conduct on Agricultural Data Sharing, which encourages transparency and user rights.

Best practice to consider

Integrate digital tool extension services into funding and programs arising from future FPT agriculture policy framework agreements. For instance, governments could provide incentives for farmers to work with partners on identifying opportunities to adopt and maximize the use of digital tools.

3.4.   France: Startup-driven innovation

France's approach to supporting innovation in agriculture is characterized by significant government investment and a focus on startup-driven innovation. The France 2030 plan allocates €2.3B to agtech startups, emphasizing scalable solutions like AI-powered robots from Naïo Technologies. Additionally, France offers a 30% tax credit for research and development costs, up to €100M per year, with SMEs eligible for faster refunds, which helps attract outside capital into the agtech sector. This strategy has contributed to France's success in retaining a high percentage of its agtech intellectual property. For example, in 2023, Agdatahub , a farmer-controlled data platform, secured €4.8 million from public and private investors to expand interoperability. Agdatahub facilitate secure data exchange between farmers and agribusinesses, aiming to interconnect all 380,000 French farms with 85,000 sector partners, focusing on traceability, carbon accounting, and supply chain optimization.

The Pays de la Loire Region offered farmers support through a voucher program to increase awareness, knowledge and adoption of digital practices. The vouchers supported farmers getting advice from experts and provided financial support to cover part of the cost of adopting new digital solutions.

France has prioritized rural 5G deployment through telecom operator partnerships, with 81% of authorized 5G sites operational as of 2024. Under the France 2030 plan, €735 million is allocated to expand 5G infrastructure, including 2,000 sites in low-density, often rural, areas. Farmers in low-connectivity zones can also access a one-time subsidy of up to €300 through France's Digital Cohesion of Territories program to install wireless connectivity solutions, including satellite broadband - part of efforts to achieve superfast coverage (≥30 Mbps) across France by 2025.

France also fosters collaboration through initiatives like La Ferme Digitale, a community of over 100 startups focused on developing digital solutions for agriculture. Furthermore, France's partnership with Morocco, as seen at the recent International Agricultural Show in Paris, highlights its commitment to international collaboration and knowledge transfer in digital agriculture.

Best practice to consider

Inspired by France's success, Canada could consider better offering tax incentives to technology developers and launching an innovation voucher program to increase access to digital extension services and to support agtech adoption. Doing so would replicate aspects of France's strategy that is focused on supporting domestically produced agtech tools and retaining intellectual property in the Canadian agtech sector.

3.5.   United Kingdom: Farmer-centric data monetization

The UK's Farming Innovation Programme funds research into blockchain-enabled sustainability solutions. For example, a project led by Breedr empowers dairy farmers to monetize methane emissions reductions via smart blockchain contracts. The UK's Farming Innovation Programme allocated £14 million to net-zero competitions, with grants ranging from £28K–£56K for feasibility studies and £1M–£6M for long-term research and development projects. Additionally, the newly established Regulatory Innovation Office (2024) aims to simplify approvals for agtech solutions by coordinating regulators.

The UK government funds rural connectivity through initiatives like the £40 million 5G Innovation Regions Fund and Shared Rural Network, focusing on 4G expansion. The UK has set a target of 95% wireless internet coverage by 2025. Private 5G trials, such as Virgin Media O2's project at Overbury Farm, are also actively testing IoT applications for agriculture. And farmers in designated regions funded by the 5G Innovation Region Fund can access subsidized connectivity solutions through local partnerships, such as Boldyn Networks's private 5G deployment in West Sussex.

The UK has enhanced its agricultural data governance practices through the recent creation of the UK Farm Data Principles certification, launched in February 2024. This certification ensures that companies working with farm data adhere to transparency standards, giving farmers increased control over data sharing. As of March 2025, 23 organizations, including retailers, agribusinesses, and agtech firms, have been certified.

Best practice to consider

Establish a regulatory framework that simplifies the approval process for digital agtech innovations. This could involve creating a similar regulatory innovation office in Canada, thereby encouraging innovation and the adoption of digital technologies in agriculture.

4. Digital agriculture as a national strategic priority

The broad policy ecosystem in Canada - the players, relationships, vision, and approach - does not currently support digital agriculture as a strategic national priority. This lack of policy alignment is holding back progress in the Canadian agriculture sector at a time when the stakes have never been higher.

While Agriculture and Agri-Food Canada (AAFC) plays an important role in advancing sector-specific initiatives, its narrow focus fails to capture the cross-cutting nature of digital agriculture, and this siloed approach leaves billions in economic potential untapped while other nations race ahead with coordinated digital agriculture strategies. At the same time, uncoordinated provincial initiatives create regional disparities in adoption rates that have outsized impacts on small- and medium-sized farms. Further, the lack of coordination between federal departments beyond AAFC prevent Canada from leveraging its considerable technological expertise in research institutions and the private sector.

> **"It's so easy to find ourselves focsed almost exclusively on urgent issues of the day such as trade disruptions, weather-related disasters or biosecurity . These are very real issues that have very dramatic, real-time impacts on farmers across Canada, and we cannot ignore them. But I would argue, we equally cannot ignore the types of investments that we need to be making in data and innovation right now. If we don't, we'll be in a very poor position relative to our competitors internationally."**
>
> *- Brodie Berrigan, Canadian Federation of Agriculture*

The interviews undertaken for this report highlight how the fragmented federal-provincial policy landscape affects adoption on the ground: farms struggle with access to funding and technical support; ag-tech startups face barriers in scaling their solutions due to regulatory complexity and inconsistent demand; and farmers lack clarity on how digital tools can deliver tangible benefits beyond theoretical promises.

Without clear data governance frameworks or interoperability standards, farmers also face barriers integrating agtech tools into their operations. Many see "digital agriculture" as a buzzword, not a practical tool to boost profits or weather tough seasons. Farmers want results, not experiments, and they need to see the payoff in dollars and cents.

> **"And it's also about them [government] having the right pieces of infrastructure in Canada for incubating and testing R&D. So…traditionally, that would, those were research farms. But now that we're in a digital area, maybe we need to have rethink what those farms look like, and you know, are they public? Are they private? Are they public, private? I think now's a good time to question, do we have the right model? And do we have the right model that's going to meet the needs of Canada?"**
>
> *- Craig Klemmer, Farm Credit Canada*

At the same time, the global agricultural industry is evolving rapidly. Trading partners are no longer simply purchasing food; they demand proof of sustainability, verified production methods, and increasing traceability.

Without robust digital systems to meet these demands, Canadian producers risk getting locked out of key international markets. Competitors like the U.S. and China, outspending Canada significantly on agtech research and development, are racking up productivity gains and digital capabilities that threaten Canada's exports in the face of rising protectionism.

Since January 2025, U.S. tariffs have been squeezing already tight margins, pushing farmers to cut costs and boost efficiency. Brett Maxwell from AAFC framed this as an opportunity, noting, "If these tariffs do come in place and persist, it is an opportunity for us to maybe fix some things structurally…less reliance on labour, we find more automation."

This is why digital agriculture must be a national priority over the next decade. Increased focused investments that drive the adoption of digital tools on-farm can be a time-limited sprint that helps the Canadian agriculture sector complete its digital transformation, a process that can no longer be delayed. Many farmers are aging out of the industry, with the average age nearing 60, and many plan to retire without clear successors. The next generation is stepping up, but they inherit a system that is not well designed to support their success with advanced digital technology. This demographic shift, alongside farm consolidation and rising economic stakes, marks a now-or-never window to transform Canadian agriculture. Waiting quite simply means falling further behind.

> **"It's complex. But if you really want to move the needle for digital agriculture adoption in Canada, it must start at the grower level. That doesn't mean allocating money to spin up companies that go and collect the data because we already have lots of those. It means empowering the grower to do it, putting incentive in their pocket to employ the technology, and then the rest of the data supply chain will grow from there."**
>
> *- Martin White, Enns Bros.*

Succeeding with digital agriculture in Canadian agriculture demands a unified push across federal departments and provinces, pulling farmers, startups, colleges, and agri-businesses into a unified ecosystem. The next FPT agriculture policy framework, the successor to the S-CAP, must prioritize digital agriculture as a vehicle to improve farm outcomes and business models. It should fund practical solutions that encourage farmers to put proven technology to work, allowing more farmers to see digital tools in action. Increased adoption of digital technology can be an additional tool in the toolbox for Canadian farmers facing trade barriers, supply chain snarls, and labor shortages. Stronger farms also mean improved environmental sustainability, safer food, and enhanced trust between farmers and consumers at home and abroad.

There isn't any time to lose. The 10-year sprint to complete the digital transformation of Canada's agriculture sector must begin now. By 2035, digital tools on-farm should be the norm, woven into how all farms run, boosting productivity without the need for continued government funding. And, at the same time, further delays to digitizing Canadian farm operations will mean our agriculture sector will be stuck playing catch-up relative to international peers.

4.1. Policy recommendations

Positioning digital agriculture as a national strategic priority requires targeted action across multiple policy dimensions. The insights gleaned from stakeholder interviews, landscape analysis, and international comparisons point to five strategic interventions that would help to significantly improve the rate of digital agriculture technology adoption on Canadian farms.

First, make digital agriculture a national priority by identifying it as a core pillar in the next FPT agreement and establish a 10-year digital action plan for the Canadian agriculture sector.

Canadian farmers face rising costs, trade disruptions, and climate challenges, and governments have struggled to offer meaningful solutions and support. The S-CAP framework and programming missed the mark by failing to make digital agriculture a priority. The next federal-provincial-territorial (FPT) agreement in agriculture must seize the moment. Agriculture ministers should designate digital agriculture as a national priority and a core component of the upcoming agreement. And to ensure governments remain aligned on this long-term strategic objective, FPT agriculture ministers should also create a 10-year digital agriculture action plan with ambitious targets, dedicated resources, and firm policy commitments to drive results.

Digital agriculture presents a transformative opportunity, with the potential to unlock between $750 million and $1.5 billion[2] in annual net new revenue over the next decade for Canadian farmers by driving productivity gains, enhancing sustainability, and strengthening competitiveness against global peers.

Elevating digital agriculture is a practical way governments can help farmers boost profitability, sustainability, and competitiveness. Canada cannot keep sidestepping bold choices. A moonshot-style push, with funding for development and adoption alongside clear goals and a roadmap to surpass countries like Australia and the Netherlands, can make Canada a digital agriculture leader.

Second, establish digital agriculture hubs to connect farmers, technology developers, ecosystem organizations, and provincial and federal governments.

Farmers lack faith in untested technology and agtech companies often misunderstand farm realities. Regional digital agriculture hubs can play an important role in fixing these challenges and enabling coordination between key stakeholders. These hubs would unite trusted partners, such as farm organizations, the federal and provincial governments, and non-profit ecosystem organizations like EMILI and Bioenterprise, to facilitate the development and adoption of digital agriculture tools.

Digital agriculture hubs will only succeed if they create meaningful engagement between key players across the digital agriculture ecosystem. Hubs can build on the experience of the Pan-Canadian Smart Farm Network to support commercial scale testing, tackle the on-farm skills gap and mitigate the impact of regulatory barriers.

France's La Ferme Digital is an example of how this can be done in practice, with 100+ startups teaming up with farmers to create new innovative solutions relevant to the local agriculture sector.

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[2] These figures are not absolute values but an indication of the great potential, based on studies like the Farm Credit Canada report on productivity potential and the importance of digital agriculture as a driver, potentially contributing at least 25% to that growth, as supported by the Canadian Federation of Agriculture's 2024 report on data-driven sustainable productivity, which highlights how digital agriculture can increase yields by 10-20% and cut costs like water or fertilizer by 15-30%. Global trends, like McKinsey $100-150 billion AI potential worldwide, were considered as well, to ensure Canada's share makes sense.

Canada has the pieces – innovative farmers, cutting-edge agtech companies and a robust post-secondary research system. Digital agriculture hubs would tie them together, reducing overlap and boosting adoption across all farm types. Governments should seed the effort while local players take the lead, earning farmer trust and driving on-farm impact.

Third, launch a coordinated program suite that supports infrastructure, commercial-scale technology testing and encourages early adopters.

Spotty internet, unproven technology, and weak program support have stalled Canada's progress in digital agriculture. As this report highlights, less than 80% of rural Canadians currently have access to high-speed internet, and smaller farms often hesitate to invest in new technology that promises uncertain returns. A coordinated program suite must tackle three priorities: improved internet connectivity, commercial-scale technology testing, and support for early adopters.

First, governments must prioritize agricultural areas for investments in connectivity, drawing on lessons from Australia's Regional Tech Hub model. Farmers often express frustration with delays in internet connectivity; they need solutions now, not distant promises.

Second, fund commercial technology trials on real working farms. Farmers want data from technology demonstrations that mirror their operation, not experimental results from test plot sites. Governments and technology companies should pay producers to test mature technology at scale with the goal of having 5,000+ acres across multiple regions and crop types active in commercial technology testing by 2030. Commercial testing is essential to proving out the return on investment of new technologies. Finally, governments must carve out funding to support early adopters of new digital tools through grants covering 50% of the cost associated with priority emerging technologies by leveraging advanced AI and robotics.

That said, policy coherence is key. Syncing up programs supporting increased connectivity, commercial technology testing and incentives for early adopters into a unified policy framework answers the call from farmers and startups for clarity and has the potential to spark on-farm adoption.

Fourth, the federal government should facilitate the development of markets that leverage agriculture data to deliver tangible value to farmers.

Farmers can generate valuable data through digital tools, yet without clear markets for this agricultural data, they may not see a direct payoff. The government can address this issue by fostering markets where agriculture data creates real value for farmers, such as premium pricing for traceability in export markets. For example, Environment and Climate Change Canada (ECCC) can play a constructive role by accelerating frameworks that reward sustainable farming practices, but success is unlikely through government action alone. Groups like the Canadian Agri-Food Sustainability Initiative and companies such as GrainFox, TELUS Agriculture & Consumer Goods and Farmers Edge can also help to develop platforms where farmers are rewarded for their data, and putting farm data to work to meet buyer demands for transparency and traceability. Internationally, the Dutch FarmTrace system shows how this can work, with farmers earning higher prices from retailers by proving their produce is pesticide-free using farm data. Canada, with its export-oriented agriculture sector, has significant untapped potential here. Despite this promise, no cohesive market frameworks exist to support the creation of new value from agricultural data for farmers. The federal government can seed these markets with pilot funding, partner with industry to set standards, and ensure farm data ownership remains in the hands of producers.

Fifth, the federal government must implement a comprehensive national data strategy making it easier for agtech tools to integrate with the broader digital economy.

As highlighted in this report, proprietary platforms can lock farmers in, spark privacy fears, and limit interoperability. A national data strategy helps resolve these challenges with robust guidelines related to data ownership, privacy, security and interoperability. Clear standards, inspired by similar efforts in peer countries, the UK's Farm Data Principles, would empower farmers and foster trust across the digital agriculture ecosystem.

A national data strategy would also fuel Canada's agtech ecosystem by creating a transparent and fair arena for innovation and growth. Strong data governance standards build trust and pave the way for a thriving data agriculture sector.

Conclusion: Time to act

The landscape scan and research make clear that Canadian agriculture is entering a critical period as it undergoes a digital transformation. External pressures demand productivity improvements precisely when digital technologies offer unprecedented potential to transform agricultural production. Yet there are persistent challenges that slow on-farm adoption of new digital tools. Further, fragmented private sector investment and uncoordinated federal and provincial public policy interventions leave the Canadian agriculture sector and Canadian farmers falling behind international peers and competitors.

In this report, we have identified five recommendations that go beyond incremental improvements to help align Canada's approach to driving on-farm adoption and use of digital agriculture technologies. By addressing internet connectivity, knowledge transfer, technology demonstration, financial incentives, and data governance together, these policy recommendations can transform a fragmented policy ecosystem into one that makes digital agriculture a national priority. The next federal-provincial-territorial agricultural policy framework agreement (2028-2033) is a critical opportunity to operationalize these policy recommendations.