Artificial Intelligence for a Thriving Agri-Food Ecosystem in Canada

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Executive Summary

Canada's agri-food sector stands at a critical juncture, facing mounting pressures such as labour shortages, while global advancements in Artificial Intelligence (AI) present unprecedented opportunities for productivity and sustainability. This report synthesizes the outcomes of the National Dialogue Series on Artificial Intelligence in Agriculture and Food, a three-part sequence of events gathering cross-sector leaders held in 2024 and 2025. The Dialogues were convened by AI4Food and explored how AI can be responsibly and effectively integrated across Canada’s agri-food system. They focused on both opportunities and challenges, identifying the governance, infrastructure, and coordination required to support AI adoption at scale. Structured around agriculture and food systems, food safety, and data sovereignty, the report synthesizes critical observations made during the Dialogues regarding Canada’s positioning for AI implementation.

The report first outlines how the Dialogues unfolded and the perspectives represented across the value chain, including from producers, industry, government, and research institutions. It then assesses Canada’s current state of readiness, highlighting foundational strengths such as globally recognized AI and agri-food research capacity, a highly trusted food system, and a collaborative sector culture. At the same time, it identifies persistent barriers, including data fragmentation, governance misalignment, infrastructure gaps, and uneven cross-sector adoption rates.

A central finding is that Canada’s opportunity lies in coordinated, agri-food system-level integration rather than isolated innovation. While AI applications are emerging asynchronously across production, processing, and food safety, their impact remains constrained by limited interoperability, unclear data governance frameworks, and ongoing concerns related to trust, privacy, and cybersecurity.

Executive Summary

As global competitors advance AI-enabled systems, Canada risks falling behind on productivity gains and market competitiveness. Should Canada becoming a downstream adopter of externally developed technologies and standards, we risk a lack of representation by our own agri-food values and priorities.

The report also identifies several risks of inaction, or of overly protracted AI adoption timelines. As global competitors advance AI-enabled systems, Canada risks falling behind on productivity gains and market competitiveness. Should Canada becoming a downstream adopter of externally developed technologies and standards, we risk a lack of representation by our own agri-food values and priorities. Workforce dynamics further reinforce the need for critical action. Agricultural labour shortages, an aging workforce, and increasing operational complexity position AI as a critical tool to augment capacity and support decision-making, but only if adoption is timely and comprehensive.

Finally, this report presents a set of actionable recommendations that translate Dialogue insights into coordinated national priorities. These include the development AI and data strategies, strengthened governance, policy and trust frameworks, workforce skills advancement, and aligned public and private investment. Implemented collaboratively and with urgency, these actions position Canada to leverage its strengths and advance the responsible, competitive integration of AI across the agri-food system.

The National Dialogue Series: How it Unfolded

The National Dialogue Series on Artificial Intelligence in Agriculture and Food was a series of three events convened in Fall 2024 and 2025 to explore how artificial intelligence (AI) and data-driven technologies can be responsibly and effectively integrated across Canada's agri-food system. The series was developed in response to growing interest in AI-enabled tools, alongside recognition that adoption across the sector remains uneven and constrained by governance, trust, workforce readiness, and system-level coordination challenges.

The first dialogue was on Artificial Intelligence in Agriculture and Food, in partnership with the Centre for International Governance Innovation (CIGI). It convened experts from the diverse fields of technology, agriculture, and food to discuss emerging AI applications, sector readiness, and the policy and governance frameworks required for responsible adoption. The second event focused on Food Safety, and was delivered by AI4Food in partnership with the Canadian Food Inspection Agency (CFIA), the University of Guelph's Research Innovation Office (RIO), and the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA).

The third and final dialogue was themed AI and Data Sovereignty in Agri-Food, and it explored the operational complexities of data accessibility and governance with international experts in the context of AI's rapid emergence.

Definitions and Terminology

Artificial Intelligence (AI): a branch of computer science that enables machines to simulate human-like cognition, such as learning, reasoning, problem-solving, perception, and decision-making. It involves developing systems that can analyze data, identify patterns, and act autonomously to achieve specific goals, often improving their performance through experience. It includes subsets such as expert systems, machine learning, neural networks, Generative AI and large language models (LLM).

Agri-food sector: Canada's agri-food sector covers primary agriculture (including crop and livestock production), food and beverage processors, food retailers and wholesalers, foodservice providers, and input and service suppliers for the farming industry.

Trustworthy AI: AI systems that are reliable, transparent, secure, privacy-preserving, explainable, sustainable and accountable, operating under clear governance frameworks and subject to human oversight.
Ethical AI: AI developed and used in ways that uphold fairness, transparency, human values, and equitable distribution of benefits across society.
Explainable AI (XAI): XAI comprises processes and methods that help human users understand, evaluate, and trust AI model outcomes and their impacts.
AI Technologies: Tools emerging from the advancement of AI, including but not limited to decision support tools and dashboards, robots and automation tools, AI assistant tools, digital twin and augmented reality tools.

AI4Food: An Effective Convener

The dialogue series was organized under the AI4Food Technology Hub, in collaboration with national and international partners. AI4Food was established to advance responsible AI adoption in agri-food by bridging research, policy and practice, and by creating spaces for interdisciplinary and cross-sector collaboration. The mandate of AI4Food is to contribute to the creation of new knowledge and innovation to improve agriculture and food systems' resilience, safety, production, and sustainability at the national and international levels through the use of data, AI, digital infrastructures, new policies and new business strategies.

Three Unique Dialogues, Three Jumping off Points

Across the three National Dialogues, a broad scope of topics spanning the agri-food value chain was addressed by an assembly of highly respected experts who explored applications and implications of AI across various sectors. The format combined expert panels, keynote presentations, and facilitated roundtable discussions which encouraged open exchange and respectful engagement. Attendees represented perspectives including academia, federal and provincial government, municipal and regional governments, agri-food businesses, industry associations, Agri-Food Tech firms, research networks, and standards organizations, from across Canada, and some other countries, which rounded out the discussions with an international perspective.

AI is rapidly reshaping food systems globally, influencing how food is produced, processed, monitored, transported, and regulated. As international standards, digital infrastructures, and market expectations evolve, jurisdictions that move deliberately and strategically will shape the terms of engagement in AI-supported global agri-food systems. Canada has strong foundations in AI research, agricultural science, regulatory infrastructure, and public trust in its food system, yet AI technology innovation and adoption across the agri-food value chain remains uneven and fragmented. Convening the National Dialogue Series at this moment provided an opportunity to move towards coordinated, collaborative, and evidence-informed discussion about practical implementation. By engaging leaders across sectors, the series created space to examine both opportunity and risk. As a trusted middle-power, Canada can actively shape how AI is embedded into our global food system while using it to meet our national needs. This will not only make our sector more globally competitive but also ensure sustainable practices are implemented locally to

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The discussions aimed to position Canada both as a reliable creator and builder of cutting-edge AI technologies, and as a thoughtful leader in applying them responsibly. This means using AI to anticipate and manage risks, from climate change impacts on crops to market disruptions and ethical dilemmas. It involves carefully balancing economic efficiency with ethical considerations, protecting the interests of individual farmers, consumers, preventing the concentration of power and decentralizing decision-making. Ultimately, Canada can demonstrate how AI can build resilience and trust in complex food systems, leading by example for a more secure and equitable future globally.

The First National Dialogue on Artificial Intelligence in Food and Agriculture

The inaugural National Dialogue on Artificial Intelligence in Food and Agriculture was convened by AI4Food in collaboration with CIGI. This two-day event combined keynote presentations, expert panels, and six facilitated roundtables addressing core themes: The Farm of the Future, Food Security, Sustainability, Food Safety, One Health, and Data and Technology Governance. Discussions explored how AI applications, from precision agriculture and robotics to predictive food safety analytics and epidemiological modelling, are driving an evolution in decision-making across production, processing, and distribution systems.

Participants represented a wide cross-section of the value chain, including primary producers and automation networks, food quality and safety , researchers, supply chain and traceability experts, sustainability leaders, cloud infrastructure providers, and digital governance specialists. Regional representation included Ontario, Prairie-based innovation networks, and national federal agencies. The diversity of sectors present reinforced that AI adoption in agri-food is not confined to a single domain but requires coordination across interdependent systems.

A distinct feature of this first dialogue was its systems-level breadth. Rather than focusing solely on technical capacity, discussions often returned to governance, interoperability, trust, and adoption challenges, all in the Canadian context. Overall, the first National Dialogue established a comprehensive baseline for understanding both the opportunities and structural barriers associated with AI integration across the agri-food ecosystem, and positioned AI4Food and CIGI as effective conveners and catalysts for continued national conversation and coordination.

The Second National Dialogue on Artificial Intelligence for Food Safety

The National Dialogue on Artificial Intelligence for Food Safety focused specifically on how AI technologies can strengthen inspection, contamination detection, predictive risk modelling, supply chain traceability, and food safety culture. Organized by AI4Food in partnership with the CFIA, the University of Guelph's Research Innovation Office (RIO), and the OMAFA, the dialogue convened diverse expertise from regulators, policymakers, scientists, food safety researchers, and industry practitioners including representatives from food companies.

This Dialogue combined keynote presentations,

expert panels, poster presentations and roundtables to extensively explore a range of critical themes beyond Food Safety, including Food Identity, Food Quality, and enhancing Food Supply Chain Resilience. Participants engaged in in-depth conversations about practical AI applications. These included advanced real-time monitoring systems for continuous oversight, pathogen detection models to identify harmful microorganisms, traceability platforms for tracking food from its source to the consumer, and the use of machine learning to pinpoint contamination risks before outbreaks occur. Together, these technologies shift food safety from a reactive oposture to a proactive, predictive, and preventive approach that anticipates risks, implements early-warning systems, and reduces the likelihood and impact of future incidents. The event also featured contributions from representatives of international locations (e.g. the European Union) who demonstrated some of their sophisticated multi-national initiatives. These presentations offered valuable insights into crucial models for ongoing learning and collaborative strategy for Canada.

A defining characteristic of this dialogue was its strong applied orientation and its focus on risk mitigation. Although critical themes such as data governance and building trust were discussed, conversations largely focused on the practical, operational integration of AI. This involved exploring how new AI tools could enhance existing safety protocols, and crucially, how this could be achieved without undermining public confidence in our food system. Ultimately, this dialogue reinforced that food safety represents one of the most impactful and responsible entry points for the adoption of AI within Canada's agri-food system as it can provide immediate benefits for public health.

The National Dialogue on Artificial Intelligence and Data Sovereignty in Agri-Food

The third dialogue focused on AI and Data Sovereignty in Agri-Food and examined foundational questions related to data ownership, access, security, interoperability, and national digital infrastructure. The online event was aimed at exploring challenges and needs for effective adoption of AI in the Canadian context, and data sovereignty in agriculture and food systems more broadly.

The discussions during this event explored the essential need for standardized data and consistent terminology, the complexities involved in sharing data across different, provincial and jurisdictional boundaries, and the importance of ensuring effective coordination between federal and provincial authorities. Furthermore, attention was given to the issue of trust among various stakeholders, particularly concerning privacy and confidentiality, and to establishing robust and secure digital infrastructure, which would also serve as a means of maintaining trust.

The dialogue also covered key themes related to trust and transparency in data handling practices and fairness within the evolving data economy. Participants discussed the business value that AI brings to agricultural producers, and the role of neutral entities or universities in creating shared, interoperable data spaces. Building coherent, well-governed, and trusted data ecosystems and supporting collaboration throughout different sectors and across national borders were also discussed.

The Dialogues in Context: What we Heard

1. Canada's Current Agri-Food State of Readiness for AI

Canada enters the AI era in agri-food with several meaningful strengths. The country has established itself as a global leader in AI research, with internationally recognized hubs funded by the Canadian Institute for Advanced Research (CIFAR). Many foundational contributors to modern AI have Canadian affiliations, and this legacy continues through strong federal research funding and abundant university-industry collaboration. Canada also maintains one of the most trusted food systems in the world, highly regarded by both by domestic and international consumers. While Canada's robust regulatory processes can be perceived as overly bureaucratic (or challenged by too much "red-tape"), they also underpin the credibility, safety, and accountability that distinguish Canadian food products in domestic and export markets. That regulatory infrastructure, coupled with abundant natural resources, a highly educated general population and relatively technologically savvy agricultural workforce, and diverse agricultural outputs, positions Canada with both the technical capacity, human resources, and structural stability to responsibly integrate AI across its food system.

2. Cultural Conditions: Risk-Averse and Collaborative

A recurring subtext throughout the National Dialogue's discussions is Canada's socioeconomic and cultural baseline. Canada is generally acknowledged to be a risk-averse and fiscally cautious nation. Public investment decisions are scrutinized and often aligned with the timeframes of federal-provincial-territorial agricultural policy frameworks (five years). Regulatory change is often incremental, and sectors such as agriculture and food seem to prioritize stability and long-term viability over rapid disruption or reactivity. However, recent volatile market disruptions and global uncertainties have revealed a surprising capacity for Canada to adapt its traditional cautious approach. These events have, at times, prompted unexpectedly rapid and direct federal interventions, moving beyond typical incremental adjustments. This demonstrated nimbleness, born out of necessity in crisis, could serve as a valuable precedent for fostering AI adoption, which also demands responsive governance, agile funding mechanisms, and flexible policy adjustments due to its rapid evolution. The complexity of Canada's food system (spanning input supply, primary production, processing, transportation, retail, and export) requires coordination across federal, inter- and intra-provincial, and municipal levels, as well as across private and public stakeholders. The National Dialogues reinforced that no single stakeholder can advance AI adoption independently. There remains a strong collaborative ethos within Canadian agri-food, a recognition that "a rising tide lifts all boats." If harnessed intentionally, this systems-oriented culture can become a competitive advantage rather than a constraint borne of complexity.

Challenges and Risks

1. Data Fragmentation, Quality and Infrastructure

Despite its strengths, Canada's readiness for AI in agri-food is constrained by fragmentation and a need for infrastructure alignment. Data fragmentation in agri-food stems from the sector's historically decentralized data environment. Information is generated across farms, processors, logistics providers, regulators, and research institutions, each using different systems, definitions, and legal and governance frameworks. Without common standards or interoperable processes and infrastructure, these datasets remain difficult to combine and use, limiting the ability of AI systems to generate reliable insights across the value chain.

Participants highlighted the difficulty of sharing data across jurisdictions and organizations, noting that even within federal departments, internal data sharing remains complex. One participant observed that it took a decade to establish a national animal traceability database across provinces. This underscores the protracted and structural complexity of aligning definitions, standards, and legal agreements across jurisdictions.

A central tension emerged around the definition of sovereignty itself: whether it refers solely to data residency within Canada, or to broader governance mechanisms that ensure Canadian data is used in accordance with domestic legal, ethical, and economic priorities.

Questions of sovereignty extended beyond data residency, and the logistical constraints of data sharing, to governance: who controls access, how data is used once shared, and how Canadian interests are protected within global supply chains.

> **"Sovereignty doesn't mean the data cannot leave Canada. How do we ensure that sovereignty includes how we share data and how that data, once shared, is used and for what purposes?... Do we require mechanisms by which data can leave the country, but we guarantee it's used based on how we define it?**
> **- A National Dialogue Participant**

Beyond concerns about data privacy and integrity, the dialogues also emphasized the multifaceted nature of cybersecurity threats. The agri-food system is filled with digital entry points, including interconnected on-farm machinery, smart sensors, processing plants, and transportation networks. Cybersecurity vulnerabilities are also frequently introduced by human factors. Moreover, the inherent complexity of advanced AI systems introduces new weaknesses which makes them challenging to audit and secure against sophisticated attacks. Participants cited examples like robotic milking systems held for ransom and processing plants facing digital extortion. Critically, many actors in the supply chain remain unaware of these dangers and often undertake major digital renovations without adequate security protocols.

From the Sustainability roundtable of the first National Dialogue, participants described critical data quality challenges in initiatives like carbon programs, where yield monitors were poorly calibrated, application maps mislabeled, and verification processes hampered by inconsistent data formats. Similarly, in food processing and

safety contexts, data quality issues arise from inconsistent sensor readings on production lines, varying manual inspection records, or non-standardized lab results, leading to unreliable input for AI models and limiting the ability to detect food safety threats and optimize food production efficiency. For AI systems, such quality issues force developers to spend significant time cleaning, validating, and reconciling datasets before models can be trained. This ultimately slows innovation and discourages private investment in new applications.

Beyond quality, significant data accessibility issues were also highlighted. Participants noted that high-quality datasets, such as those within supply-managed sectors, are often tightly controlled and difficult to access for broader innovation. For AI tools to thrive, datasets of any nature must be privacy-first and confidentiality-first, enabling open-access across the supply chain and inter-jurisdictionally to allow appropriate stakeholders access for iterative improvement.

These examples illustrate that Canada does not lack data; rather, it is challenged in achieving unified interoperable platforms, common standards, and, in some cases, open-access capable of supporting AI-enabled insight at scale. For AI systems, fragmented or inconsistent datasets, coupled with an absence of clear standardization and comprehensive legal frameworks, reduce model reliability and increase the cost of developing usable tools.

A further infrastructure consideration was that large datasets require significant network bandwidth, computing capacity, and data transfer abilities, which may not be readily available across organizations. In some cases, participants noted that transferring large datasets could take weeks using existing systems, and reducing these timelines required substantial investment in digital infrastructure of over several millions of dollars.

Participants further highlighted a major operational hurdle: the continued use of outdated 'legacy' systems and equipment. This challenge becomes exacerbated during business changes, like mergers and acquisitions, as expanding food companies and agribusinesses frequently inherit a mix of different, incompatible software. Similarly, it is very hard and expensive to fit modern AI tools into the government's long-standing, decades-old rules and reporting systems. Upgrading these old systems in both public and private sectors remains a significant barrier to using AI solutions together effectively.

Trust also emerged as a significant barrier at accelerated and effective AI usage. Farmers frequently expressed skepticism about data-sharing arrangements, questioning who truly benefits from the data and whether a fair proportion of the generated value returns to the primary producers. This skepticism is increased by growing concerns over cybersecurity, with many farmer associations and Agri- and Food-Tech companies wary of the vulnerabilities associated with increased digitalization, fearing potential data breaches, hacking, or even ransomware attacks that could cripple their operations or compromise sensitive information. Alignment of data collection protocols and ensuring data interoperability are also persistent challenges, particularly felt on the 'frontlines' of data acquisition, where varying methods and equipment can lead to inconsistent or unreliable information.

2. Governance, Policy, and Legal Frameworks

Across multiple roundtables, participants extensively discussed various policy challenges and shortcomings that hinder the effective adoption and responsible integration of AI in the Canadian agri-food ecosystem. A consistent theme was the fragmentation of existing policy frameworks. Regulations were often described as lagging behind technological advancements, with a particular concern for disjointed regulatory landscapes, such as the misalignment between livestock traceability and food safety rules, or the absence of standardized safety regulations for emerging ag-robotics across jurisdictions. Concerns also arose regarding insufficient policy support for academic research infrastructure, particularly computational resources crucial for advanced AI development. Lack of policies to support access to high-quality research data surfaced as a shortcoming which slows down innovation and translation of academic outcomes into practical agri-food AI solutions.

Beyond regulatory specifics, broader socio-economic policy shortcomings were evident, particularly in food security discussions, highlighting how existing frameworks, including market mechanisms, contribute to food waste and the institutionalization of "band-aid solutions" like food banks. There was a clear call for policy to adopt a more proactive stance towards crisis preparedness, moving beyond a reactive approach, and to encourage a "lighter touch" in some areas to foster innovation, while simultaneously providing decisive policy to guide complex issues like data governance and equitable benefit distribution.

One of the governance challenges that is generally overlooked is Intellectual Property (IP). IP presents a complex and often ambiguous challenge in the rapidly evolving landscape of AI in agriculture and food. A primary concern during the Dialogue revolved around the fundamental misconception of "who owns the data," as the legal framework, which often focuses on control and use rather than absolute ownership. This ambiguity extends to confidentiality, where the value embedded in sensitive raw datasets, curated preprocessed data, and the trained AI models themselves are critical assets, but their protection is heavily focused on safeguarding their confidential aspects. If AI models are trained on confidential information without proper consent, the resulting outputs can be compromised or "tainted," making them legally unusable.

Furthermore, Canada faces an active legal debate regarding human authorship and AI-generated outputs, with particular implications for the agri-food sector. With current interpretations suggesting that human input is a prerequisite for copyright protection, innovators are left navigating significant uncertainty in how this applies to AI systems. This evolving landscape introduces fascinating new questions, such as whether the carefully engineered 'prompts' used to instruct AI systems - for instance, to optimize crop spraying protocols or generate novel food product formulations - might eventually qualify for intellectual property protection, rather than the machine-generated outputs themselves. Within the complex agri-food ecosystem, these legal grey areas are further compounded by the inherent complexity of AI models. Because these systems frequently operate as 'black boxes,' it becomes very difficult to fully audit data provenance and integrity. For example, not being able to verify risk factors for disease detection in livestock or ensure ingredient claims validated by AI can ultimately hinder compliance and elevate legal risk for early adopters in the sector.

In addition to the technical integration of AI, the National Dialogue Series explored the ethical dimensions, risks, and practical challenges of its responsible application in agri-food. Discussions emphasized that AI tools must be reliable and robust enough to function within the unpredictable biological and environmental realities of farming and food production. This standard demands rigorous testing and

validation in real-world conditions. Furthermore, solutions must be genuinely user-friendly and designed to simplify daily tasks. This practicality directly ties into accountability and human oversight, driven by a strong consensus that AI should augment, rather than replace, human judgment in high-stakes decisions. For example, while an AI system might flag a livestock disease outbreak, a human must make the final decision to cull animals due to the severe economic and moral impacts. Similarly, automated sanitation robots in food processing facilities still require human oversight. Total reliance on automation poses health risks because current AI lacks the contextual judgment to identify unexpected anomalies. Beyond these operational concerns, participants stressed the critical need for AI fairness. They warned against an unbalanced power dynamic where a few large tech companies control algorithms and data to dominate the agri-food value chain at the expense of primary producers.

3. Adoption Barriers and Investment Constraints

The National Dialogue series highlighted that beyond data governance, the agri-food sector's inherently heterogeneous ecosystem significantly impacts the adoption of AI and data technologies in Canada. It is characterized by vast differences in farm size, commodity types, manufacturing approaches, technological readiness, access to resources, and cultural contexts, including Indigenous communities. This diversity means that a "one-size-fits-all" approach to AI adoption is unlikely to succeed. Concurrently, complex human and social factors influence farmer and other actors' decisions, as these choices are not solely driven by profit maximization but also by factors like lifestyle, risk aversion, social norms, and trust.

In addition to the observations made by dialogue participants, it should be noted that adoption barriers persist at the operational level. Smaller and medium-sized enterprises (SMEs) may lack capital, connectivity, or technical literacy to integrate AI-enabled tools effectively. As one dialogue participant noted, "64% of farms with annual revenues over a million dollars report using precision agriculture. Only 24% of farms with revenues under $100,000 do. This demonstrates the economic and adoption disparities between operations of different scale."

As noted in a recent report from the Canadian Food Innovation Network, SMEs are the “backbone” of Canada’s food sector. The report underscores that SMEs account for 91% of all food businesses, and argues that their ability to adopt practical AI tools will be central to productivity, resilience, and competitiveness. It also highlights that AI is no longer theoretical in food manufacturing and supply chains: it is already being applied in real settings to improve quality assurance, compliance, logistics, and operational decision-making. However, this advancement is often not paired with a verification step to ensure that the application performs adequately and fulfills safety and quality requirements. This aligns with themes raised in the National Dialogue series, particularly the emphasis on finding applied adoption pathways that support firms and operators who do not have large internal data teams or technical capacity, with some urgency.

At the same time, Canada’s venture capital ecosystem remains cautious relative to other comparable economies. While global competitors aggressively fund Agri-Tech innovation, Canadian firms often compete for limited domestic capital or seek international investment, which may shift value creation beyond Canadian control.

Risks of Inaction

> ***Hesitation to adopt AI may diminish Canada's influence in shaping the governance of global food markets, risking a loss of control over critical aspects of food production, processing, and distribution, with value creation shifting beyond Canadian borders and influence, making Canada a follower rather than a leader***

AI is advancing rapidly across global food systems, with capacity expanding and systems continuously optimized. While caution and thoughtful governance are essential to responsible integration, prolonged hesitation carries its own risks. The National Dialogue Series underscored that delayed, fragmented, or overly conservative adoption of AI presents material consequences for Canada's agri-food sector. These risks extend beyond technological lag: they affect competitiveness, trust (both from consumers and among sector stakeholders),sustainability performance, workforce resilience, and Canada's ability to shape how digital systems govern global food markets.

Specifically, Canada risks losing vital ground in global competitiveness, as other nations rapidly leverage AI to optimize production and reduce costs, potentially sidelining Canadian producers. This inaction means falling behind on efficiency gains that could drive profitability and increase market share. As powerful international players continue to aggregate diverse datasets and develop full-stack solutions, Canadian agri-food risks becoming a mere recipient of foreign-designed systems and standards. Ultimately, hesitation to adopt AI may diminish Canada's influence in shaping the governance of global food markets, risking a loss of control over critical aspects of food production, processing, and distribution, with value creation shifting beyond Canadian borders and influence, making Canada a follower rather than a leader.

1. Market Competitiveness, Sustainability and Sovereignty Risks

The food production and distribution system is a global one. Jurisdictions that establish coherent and coordinated AI adoption pathways in the system will shape global standards, influence platform design, set market expectations and attract consumers. If Canada does not move deliberately, collectively and proactively, it risks becoming a downstream adopter of externally developed technologies and governance models that may not fully align with domestic regulatory approaches, environmental priorities, or agri- food sector values. This dynamic has implications for Canada's global brand. The country's reputation for high-quality, safe, and sustainably produced food is a strategic asset. However, as international buyers increasingly expect real-time traceability, cost-effective supply chain optimization, and digitally supported compliance systems, maintaining that reputation will depend on the seamless and timely integration of advanced digital infrastructure.

Food sovereignty is also implicated. Dependence on foreign-controlled platforms, infrastructure, or governance models may limit Canada's ability to determine how agricultural data is used, monetized, or governed within international supply chains. Without proactive coordination, Canada risks ceding influence over the digital architecture that increasingly underpins food production and distribution.

2. Governance, Data Fragmentation, and Trust Risks

A central risk to comprehensive adoption of AI lies in failing to act collectively on governance alignment. Without shared terminology, interoperable data systems, and coherent legal frameworks, AI adoption will continue to occur in sectoral silos. Fragmentation increases duplication, raises compliance costs, and discourages participation, particularly among producers and smaller enterprises who must navigate multiple data platforms and reporting systems.

The Dialogues highlighted persistent concerns regarding data quality, business models, and equitable value distribution in a data economy. Questions emerged about how data is accessed and quality-controlled, who benefits from its use, and how domestic interests are protected in international contexts. These concerns are particularly pronounced among primary producers, many of whom operate in environments where margins are tight, conditions are extremely dynamic, and trust is foundational. Producers have historically exercised caution around data sharing, particularly where governance arrangements lack transparency or where return on investment is uncertain. If AI systems are perceived as top-down, or misaligned with on-farm realities, adoption rates among primary producers will suffer.

Trust extends beyond producers to manufacturers, retailers, consumers and regulators. Privacy, cybersecurity, and system resilience are non-negotiable in food systems and were recurring themes of discussion among the National Dialogues. Weak governance or inconsistent safeguards could introduce vulnerabilities, while poorly communicated AI applications may undermine public confidence. Clear frameworks that align with legal requirements, transparent data stewardship, and visible accountability mechanisms are therefore prerequisites for adoption.

The Dialogue revealed that primary producers are often wary of sharing their data. They worry that without clear governance, their information will become an asset for others without a fair return to them. This risk of inaction allows a "tragedy of the commons" to continue, where individual choices to not to share, driven by competitive fears or uncertain benefits, prevent larger, more powerful datasets from forming that could help the whole sector. Inaction allows large tech players to gather huge amounts of farm data without Canadian oversight.

> **What are the ties that are binding data? If you haven't worked through those problems, you're not legally ready to deal with bigger data governance questions... there has to be oversight at the front end of these problems before frameworks can be established.**
> **- A National Dialogue Participant**

This defensive posture extends downstream to manufacturers and retailers, a concern explicitly raised during the food security and food safety roundtables. These stakeholders similarly expressed deep concerns about sharing data related to operational mishaps, quality control failures, or recall incidents. Their primary fear was the significant reputational damage and potential brand erosion that could result from public disclosure of such sensitive information. This reluctance, however, directly impacts the completeness and richness of datasets essential for training robust AI models, as crucial 'failure data' remains hidden. Without access to this vital 'failure data,' AI systems cannot accurately learn from past events, severely hindering their ability to predict, prevent, and mitigate future risks across the entire food supply chain.

Not solving practical data problems also causes significant issues. Issues such as inaccurate yield monitors, wrong labels on application maps, or

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inconsistent ways of recording data, result crucial information rendered unreliable for AI analysis. If valuable, high-quality data (like that in supply-managed sectors) stays inaccessible beyond its data stewards, Canada risks missing chances for AI to make the entire food supply chain much more efficient. Furthermore, if we fail to invest in better internet connectivity and computing power, Canada won't be able to process the huge amounts of data needed for advanced AI applications, leaving its agri-food sector behind in the digital race.

The Dialogue also highlighted that risks of inaction across key policy domains will lead to compounding negative consequences and impact Canada's global standing and the integrity of its food system. Data fragmentation and a trust deficit among farmers can leave the sector's vast data potential untapped, which may result in deficient global competitiveness by Canada. Furthermore, failing to establish robust cybersecurity policy will leave both physical and digital agri-food infrastructure critically vulnerable to disruptions, compromising food safety and operational integrity.

3. Workforce, Investment and Capacity Risks

AI readiness is fundamentally about people and the systems they build to operate within. The dialogues underscored that AI expertise, data science skills, and systems integration capacity are already in high demand across sectors. Without a clear and credible pathway for AI integration in agri-food, skilled professionals may migrate toward industries perceived as more dynamic or better resourced. Agriculture already suffers from an image challenge among young professionals, is experiencing an aging talent pool, and faces persistent labour shortages. This talent drift reduces the sector's capacity to design solutions tailored to agricultural realities and limits Canada's long-term innovation potential.

This threat is acutely felt among SMEs, which may lack the capital, connectivity, or digital literacy required to integrate AI tools effectively. If adoption remains concentrated among a small subset of well-resourced and large-scale stakeholders, structural inequities and siloing of solutions may become exacerbated.

In the absence of clear national direction and governance certainty, capital may remain onservative or flow toward jurisdictions with more coordinated frameworks and faster integration cycles. Historically cautious investment patterns in agri-food can slow scaling of domestic AI innovation, which risks externalizing value creation and weakening domestic control over IP and infrastructure.

These risks collectively illustrate that inaction (or overly protracted timelines for action) are not viable options. In a rapidly evolving global landscape, delaying coordinated action on AI adoption increases the likelihood that Canada's agri-food sector will struggle to compete, attract talent and investment, and retain influence over how food systems are shaped in the digital age. Proactive, leading-edge integration of AI is essential to ensuring that innovation strengthens Canada's agri-food system from input supply to food production to consumption.

A Complex But Navigable Landscape

The agri-food system is inherently complex, particularly in a landscape as vast and with commodities as diverse as Canada's. It spans livestock and crop production, supply-managed and non-supply-managed commodities, local and multinational processors, small-scale growers, Indigenous communities, retailers, exporters, regulators, and research institutions. As one participant articulated, it is a 'complex landscape' with a 'multitude of different groups', federal, provincial, municipal, not-for-profits, and private entities, making it 'hard to get a good picture of who's involved with what aspect.' The Dialogues made clear that this complexity can create (and in many instances, has already led to) duplication, inefficiencies, and siloed efforts. Participants described difficulty mapping who is responsible for what, navigating overlapping funding programs, and identifying clear entry points for innovation support.

Despite these challenges, Canada possesses a dense network of research centres, regulatory bodies, grower associations, innovation hubs, and digital infrastructure initiatives. Indeed, the Dialogues also showcased instances where this complexity has been successfully navigated, such as the CFIA's deployment of AI for seed detection, or the recognized global leadership of Canadian firms like Feedlot Health Management Services in beef research. These examples demonstrate that while the path is intricate, it is not impassable. The National Dialogue Series did not reveal insurmountable challenges; rather, it illuminated misalignment and coordination gaps that can be addressed through intentional governance, clearer terminology, shared data standards and benchmarking, collaborative infrastructure, and close partnership. While industry efforts to-date to enhance AI adoption are often fragmented or operate in silos, a more coordinated whole-systems approach would also emerge from a more collaborative infrastructure and effort.

The overarching outlook from the Dialogues is cautiously optimistic. Canada's gaps seem to be challenges with coordination, interoperability, trust, and strategic alignment, rather than structural deficits in talent, capacity or vision. A strong collaborative ethos is evident within Canadian agri-food, a recognition that 'a rising tide lifts all boats,' which, as several participants highlighted, is a distinct Canadian advantage compared to other nations. If harnessed intentionally, this systems-oriented culture can become a competitive advantage rather than a constraint borne of complexity. With deliberate action, and the appropriate leadership, Canada can translate its foundational strengths into responsible, secure, and equitable AI integration across its food system.

Jurisdictional Comparisons and International Context

Canada's opportunity lies in translating its research strength and collaborative culture into coordinated national action.

While the National Dialogue Series focused primarily on Canadian agri-food perspectives and experiences, participants also emphasized the importance of understanding how other jurisdictions are approaching AI adoption in complex sectors. To supplement the observations made during the Dialogues, the following section provides additional context by briefly examining international approaches and parallel initiatives that illustrate how coordinated strategies are supporting AI integration into food production and distribution systems elsewhere.

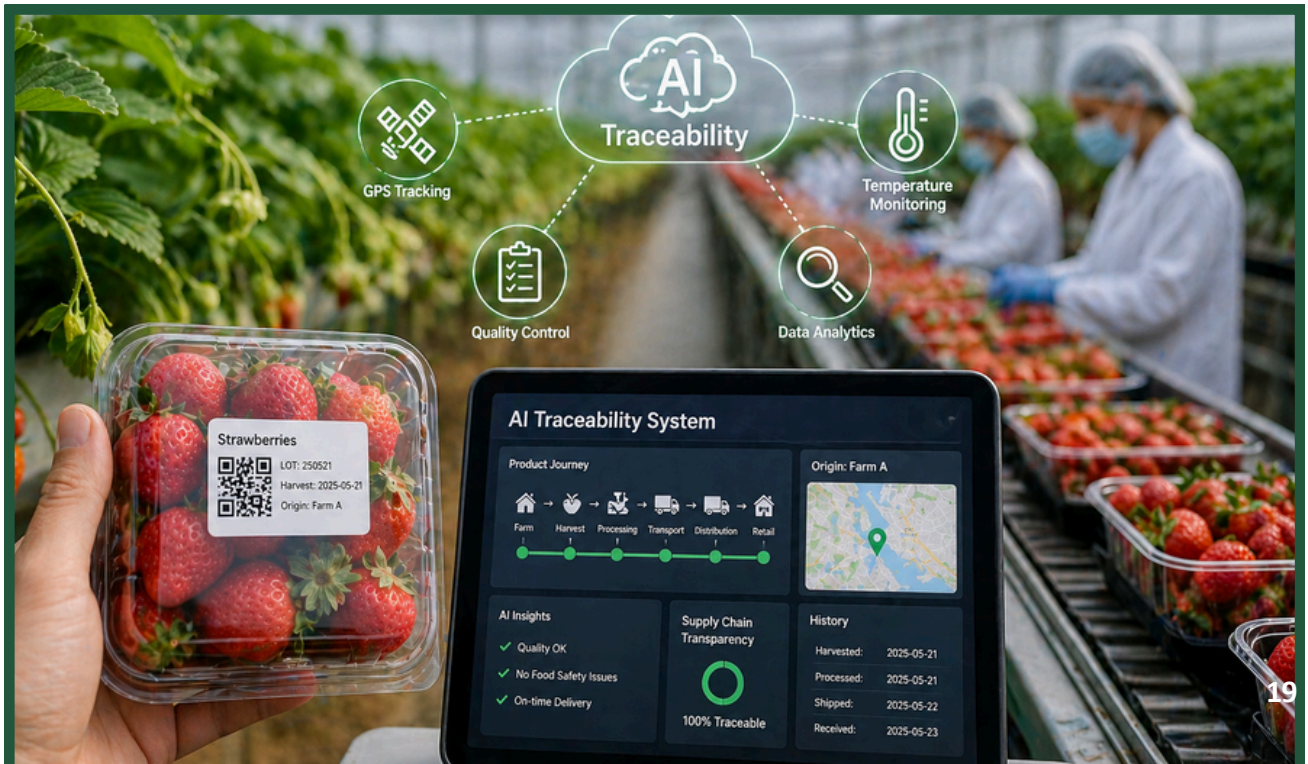
Globally, the trend appears to be that AI adoption within complex, multi-stakeholder scales does not advance in isolation. Jurisdictions that are progressing most effectively are doing so through coordinated, proactive ecosystem-building: aligning production agriculture research capacity, data governance, food distribution systems infrastructure investment, agricultural workforce development, and regulatory clarity.

Across the European Union, for example, AI integration in agriculture is increasingly supported by cross-border data harmonization efforts, shared digital standards, and publicly funded "sandboxes" designed to move technologies from pilot to practice. Rather than focusing solely on tool development for agri-food implementation, several European initiatives embed interoperability requirements, ethical governance principles, and multi-actor collaboration directly into their design. The emphasis is not simply on innovation, but on creating trusted data environments and scalable infrastructure that allow innovation to diffuse across regions and value chains. The sandbox approach allows for controlled real-world testing of AI systems within regulatory frameworks, enabling innovators and regulators to refine technologies and governance mechanisms before broader deployment into agri-food systems.

In parallel, the European Union has also introduced initiatives such as the Farm Sustainability Data Network (FSDN), which requires participating farms to contribute standardized data on farm structure, income, and sustainability indicators. Such initiatives illustrate how regulatory frameworks can actively support interoperable datasets that enable AI development while maintaining oversight and consistency across jurisdictions. Emerging technical initiatives, including shared open datasets such as The CompreHensive European Food Safety (CHEFS) database and data repository, further demonstrate the EU's emphasis on coordinated data environments designed to accelerate research collaboration and innovation towards achieving food safety. This database itself is a prime example of this scale, spanning 25 years of monitoring data (from 2000 to 2024) and consolidating over 15.2 million samples, which translate into an astonishing 392 million entries across pesticide residues, veterinary medicinal product residues, and various chemical contaminants. Agriculture of Data consortium has also been established in the EU of which the AI4Food, University of Guelph is a member.

In the United States, legacy federal investment in open science platforms, digital infrastructure, and large-scale data repositories has created enabling conditions for AI research and deployment in agriculture and food systems. The AI adoption landscape in the US has often been outpaced by the development and optimization of AI tools and systems – the latter initiatives having been spurred by a robust technological sector and high levels of interest from venture capital. However, support by national agencies in shared datasets, satellite-based agricultural landscape monitoring systems, and collaborative research environments anchored to land-grant universities that connect academia, industry, and regulators have allowed adoption to keep up on the whole. These federal investments in complement with innovation spurred by the private sector reinforce a central lesson: AI adoption accelerates when data systems are robust, standardized, accessible, and supported by sustained public infrastructure.

Other jurisdictions have paired digital strategy with agri-food sector-specific connectivity and workforce initiatives. National digital agriculture strategies in countries such as Australia and Brazil demonstrate how AI readiness and wide-scale adoption hinges on broadband access, shared computing capacity, and coordinated skills development. The Australian government has launched a National Centre for Digital Agriculture to provide national leadership, coordinate and facilitate efforts to drive a cohesive uplift in skills, education, awareness, and ultimately adoption of digital agriculture and growth of the agri-tech industry. Brazil's agricultural research system provides another example of coordinated infrastructure supporting data-driven innovation. The Brazilian Agricultural Research Corporation (Embrapa), a state-owned enterprise linked to the Ministry of Agriculture and Livestock, has increasingly adopted open science commitments requiring the dissemination of publicly funded research data through national open-data portals. These models recognize that adoption is uneven without deliberate attention to digital literacy, training pathways, and governance frameworks that clarify data rights and responsibilities. Furthermore, countries like Japan and South Korea, facing significant challenges such as aging farmer populations and limited arable land, have made substantial government investments in advanced agricultural robotics and precision smart farming systems. Their strategies emphasize the integration of IoT sensors, AI, and automated machinery directly into farm operations to maximize efficiency with reduced labor. This approach often includes direct government support for developing high-tech farm solutions and creating the necessary infrastructure for their deployment.



International discussions have also raised broader governance considerations around the agricultural data economy, including questions about equitable value distribution when producers share operational data. Several countries, particularly in Europe, have pioneered farmer data cooperatives and data trusts as mechanisms to ensure that those generating the data (particularly farmers) maintain collective control and receive proportional benefit from its use. These models highlight how collaborative governance structures can empower farmers while fostering secure data exchange. Conversely, examples from certain development contexts illustrate the risks of poorly governed systems; in some cases farmers have been compelled by local authorities to provide production data without clear benefit-sharing frameworks. These contrasts highlight the importance of voluntary participation, transparent governance, and clear economic incentives in building trusted data ecosystems. In large agricultural economies such as China and India, state-driven initiatives often focus on leveraging AI for large-scale crop monitoring, yield prediction, and agricultural resource management, frequently integrating farming services through extensive digital platforms to achieve national food security objectives.

Food security considerations have also shaped how several jurisdictions frame the role of AI in agriculture and food systems. As climate change, supply chain disruptions, and socio-economic inequities continue to challenge food system resilience, AI technologies are increasingly viewed as tools that can support improved production efficiency, reduce post-harvest losses, and optimize distribution through forecasting and spoilage detection. However, international discussions emphasize that technological innovation alone cannot resolve systemic challenges such as affordability and access. Framing food security as a structural responsibility requiring cross-sector collaboration, rather than a charitable outcome, reinforces the importance of pairing technological innovation with inclusive governance and coordinated policy action.

> **A lot of the industry, especially farmers, they want to see the business value: What value am I getting back, what's the return on my investment, what is the impact of not sharing my data? This value has to be demonstrated.**
>
> **- A National Dialogue Participant**

International experience suggests that leadership in AI-enabled food systems will be defined less by who invents new tools and more by who builds durable, trusted, and interoperable ecosystems around them. Canada's opportunity lies in translating its research strength and collaborative culture into coordinated national action. This should include leveraging its deep research expertise to develop and offer specialized AI tools and platforms tailored to the unique needs of its agri-food sector and beyond. The comparative landscape demonstrates that sustained investment in data governance, infrastructure, and workforce readiness is not supplementary to AI adoption — it is foundational. If Canada moves deliberately and collectively, it can position itself as both an essential contributor to global AI innovation, and a model for its responsible integration in complex food systems.

Recommendations

The National Dialogue Series revealed that Canada's strengths in AI research, regulatory credibility, and collaborative culture provide a strong foundation for coordinated national action. The following recommendations translate dialogue insights, observations from international comparable initiatives, and considerations for stakeholder roles and responsibilities into actionable steps. These steps are designed to mobilize stakeholders and rely on a strategic coordinating effort to strengthen governance, accelerate responsible adoption, and position Canada as a leader in AI-enabled agri-food systems.

1. National Data and AI Strategy

a. Establish a Coordinated National Agri-Food Data and AI Strategy

Develop a coordinated strategic plan aligning AI research, infrastructure investment, regulatory modernization, and commercialization pathways specific to agri-food. This strategy should build on Canada's federal AI priorities and embed agriculture and food as a priority application domain, and act as a north star for other recommendations to be implemented in alignment with.

b. Develop Interoperable, Open-Access Data Standards for Agri-Food

Create harmonized terminology, metadata standards, and interoperability protocols to enable secure and reliable digital data collection and sharing across provinces and sector stakeholders. The Dialogue underscored the importance of open datasets and collaborative approaches that respect data sovereignty, especially for Indigenous communities. Publicly funded datasets and AI tools should incorporate open-access principles wherever feasible to maximize innovation and reduce duplication. A multi-disciplinary collaboration between academia, industry, and farming communities is a critical enabler of innovation, providing pathways for new research to be translated into practical applications.

c. Create a Secure, Sovereign Digital Infrastructure Framework

Clarify data governance models, residency requirements, and cross-border data-sharing frameworks to ensure Canadian data is governed according to domestic legal, ethical, and economic priorities while remaining internationally interoperable. Future-proof this framework through foresight exercises with industry stakeholders.

Prioritizing rural broadband and digital service infrastructure will level the playing field for AI integration. Enhanced connectivity will support on-farm sensors, cloud-based analytics, and remote diagnostics, leading to higher primary data integrity. Public-private partnerships can accelerate deployment and reduce the digital divide.

2. Governance, Trust, and Responsible Innovation

a. Establish a National Agri-Food AI Governance Forum

Formalize a cross-sector committee including producers, processors, regulators, researchers, Indigenous communities, investors, and technology providers to align terminology, governance approaches, and ethical standards. This forum would function as an ongoing advisory body to guide responsible AI integration and act as a Dialogue 2.0 with outcome- orientation to implement other recommendations.

b. Develop Regulatory and Operational Sandboxes for AI in Agri-Food

Establish both operational and policy 'sandboxes' for responsible AI deployment. Operational sandboxes would create controlled test environments for diverse AI tools—tools that span agricultural production, food safety, sustainability verification, sovereign open-source solutions, and traceability. Regulators and industry can evaluate these tools collaboratively. This method reduces risk, builds trust, and accelerates responsible adoption. Concurrently, policy sandboxes would test and validate new AI-related regulatory frameworks and guidelines. For example, these could assess how policies for improved food safety protocols effectively reduce food waste. This mechanism supports evidence-based policy development and facilitates crucial cost-benefit analyses, which in turn generate compelling Return on Investment (ROI) case studies and influence industry investment and widespread adoption.

c. Establishing a Pan-Canadian Smart Network

Develop a unified, pan-Canadian smart network that reflects the country's diverse agroclimatic and commodity types to serve as a collaborative platform for experimentation and innovation. Grounded in a spirit of humility and mutual learning, this initiative is essential for harnessing collective intelligence to address complex agri-food challenges.

d. Implement Transparent Data Stewardship and Benefit-Sharing Models

Develop frameworks and toolkits outlining how data is used, monetized, and shared. Ensure producers, advisors and SMEs can understand and benefit from participation in AI-enabled systems, strengthening trust and adoption.

e. Fair, Practical, and Harmonized Data and AI Governance Practices

Implement frameworks and best practices for data and AI - technical, legal, and policy related that ensure equitable value distribution for various stakeholders to build trust and prevent market concentration. Practices must be practical, aligning with on-farm and supply chain realities through user-friendly tools and robust real-world validation.

Facilitate shared standards, common terminology, and interoperable ecosystem which will enable effective coordination across all jurisdictions, thereby to secure a transparent and accountable environment for AI adoption.

Develop green AI solutions for agriculture, food processing, and commercialization, specifically effective models that consume less power, especially in remote areas with limited energy infrastructure.

3. Workforce, Skills, and Capacity Development

a. Launch a National Agri-Food AI Skills Initiative

Develop interdisciplinary training programs that integrate AI literacy with agricultural operations, food safety and security, sustainability metrics, and regulatory compliance. Align with federal research and talent strategies to retain expertise within the agri-food sector.

b. Support Adoption of AI by SMEs Through Advisory and Extension Networks

Provide targeted support for SMEs to integrate AI tools into existing workflows, including access to resources including funding, technology and policy sandboxes, advisory services, and peer-learning models.

4. Commercialization, Investment, and Benchmarking

a. Align Public Investment with AI Readiness and Infrastructure

Coordinate capital deployment with governance alignment and infrastructure readiness to strengthen Canada's competitiveness in AI-enabled agri-food innovation. Incentivize domestic scaling of AI-enabled agri- and food-tech through investment programs, while retaining IP and value creation within Canada. Clearer governance of IP

across the AI lifecycle will help build trust, encourage data sharing, and enhance interoperable systems.

b. Establish National Benchmarking Frameworks for Sustainability, Food Safety, and Agri-Food production

Develop standardized benchmarking for data, AI models, and systems to ensure that AI-driven sustainability metrics, carbon accounting programs, and food production, processing, quality and safety analytics are comparable, ethical, verifiable, and interoperable across jurisdictions. National frameworks developed under an ethical lens would strengthen Canada's credibility and global competitiveness while improving transparency across the AI lifecycle. Clear standards also help build trust and encourage data sharing across the value chain.

c. Accelerate Technology Transfer and Commercialization Pathways

Strengthen bridges between academic AI research and practical agri-food deployment through translational research programs, commercialization accelerators, and public-private collaboration mechanisms. Accelerate connections between venture capitalists, investors and other mobilizers of capital and the agri-food sector so the investment potential is realized more readily and supports Canada's competitiveness.
Create funds that combine government support with private capital to support long-term goals. This strategy involves investing in regional networks where technology is tested on farms or food supply chain; connecting funding to these real-world results proves to investors that the technology works. Finally, incentivizing big Canadian companies and co-ops to partner with and invest in startups will help anchor new businesses domestically.

Strengthen Canadian-based investment mechanisms by retaining intellectual property (IP), support domestic entrepreneurs, and ensure that AI-driven transformation benefits Canadian producers and processors first. This may necessitate a re-evaluation of venture capital, with a shift toward coordinated, sovereign investment strategies that align with long-term national priorities.

5. Enhancing Canada's Brand and Global Leadership

a. Establish Strategic International Collaborations and Influence Global Standards

Proactively establish and strengthen strategic international collaborations by sharing Canadian expertise and learning from international best practices. Participation in global forums and multi-lateral initiatives will enable Canada to advocate for its values, protect its interests, and ensure that emerging international norms around data sovereignty, IP protection, and AI accountability reflect Canadian priorities.

b. Position Canada as a Global Leader in Responsible AI for Food Systems

Leverage Canada's strengths in regulatory credibility, AI research excellence, and collaborative governance to promote a distinct international brand that pairs technological innovation and human resources with ethical stewardship and sustainability. International partnerships and trade engagement should highlight Canada's commitment to trusted, interoperable, and responsibly governed AI-enabled food systems.

Canada should develop its own AI best practices and framework specific to its agriculture and food system context, rather than defaulting to US frameworks (which Canada cannot control) or simply importing EU regulations (which were not designed for Canada's market).

These recommendations are ambitious, but achievable, especially with a collaborative approach, administrative support, and sector alignment on their relevance and urgency.

Next Steps:
A Call to Action

The National Dialogue series underscored the urgency with which the sector must engage collectively to integrate the responsible use of AI in the agri-food sector, and the complexity of doing so effectively. Moving forward will require coordinated, intentional action that aligns sector realities with Canada's broader priorities for responsible AI development.

At the federal level, Canada has articulated a clear direction for AI that emphasizes research excellence, talent development, responsible use, and public trust. Advancing these priorities within agri-food will require mechanisms that support collaboration across the value chain, from primary production to processing, food safety, and distribution. In the near term, progress will depend on aligning foundational elements such as terminology, data governance, and ethical expectations. Without shared language and clear rules of engagement, AI tools will continue to operate in silos, limiting their usefulness and increasing burden for sector participants.

A second priority is to strengthen enabling conditions for adoption among agriculture and food industry players. This requires clarifying expectations around data quality and stewardship, privacy, cybersecurity, and system resilience, while ensuring that ethical considerations are well-integrated. It also requires sustained investment in human capacity. AI adoption in agri-food will certainly continue to depend on technical innovation, and also on the readiness of the workforce to integrate new and rapidly evolving tools into existing workflows. Human-centred design, reskilling opportunities, and trusted advisory support will be critical to ensuring that AI reduces complexity rather than adding to it.

Bridging the gap between academic research, agricultural operations, and food system requires applied science, demonstration sites, and extension services. Funding mechanisms should reward translational work and public-private partnerships focused on field-ready solutions. Farmers and other actors in the food supply chain should be co-designers, not passive recipients.

Over the longer term, the sector has an opportunity to move beyond isolated pilots toward coordinated implementation and the living lab (co-design) style experimentation. This will require continued dialogue, shared learning, and collaboration across initiatives. Neutral hubs, such as AI4Food, can play an important role in supporting this transition by facilitating alignment among researchers, industry, policymakers, and producers, and by helping translate national AI priorities into sector-relevant action. The next steps identified through the National Dialogue series provide a pathway for moving from discussion to implementation in a way that is responsible, inclusive, and grounded in the realities of Canada's agri-food system.

Addressing a Need for Decisive Sector Leadership

The National Dialogue series revealed a time-sensitive need for coordinated leadership to shape how AI is adopted across Canada's agri-food sector. Addressing shared challenges related to governance, trust, workforce readiness, data systems operability and sustainability will require effective and collaborative bridging of research, industry, policy, and implementation. As convenor of the National Dialogue and a good-faith initiative, AI4Food is well positioned to serve as a practical and influential leader, and sector-level clearing-house to mobilize this collaboration towards developing advanced, responsible AI solutions for the agri-food sector.

AI4Food brings together globally recognized expertise across agriculture, food science, veterinary medicine, environmental sustainability, and data science. This access to experts further strengthens its capacity to serve this coordinating role. This unique blend equips AI4Food to foster the development of tailored AI tools and systems for crucial areas such as agriculture and food production, risk assessment, supply chain management, and enhanced food safety and security. Located within the Toronto–Waterloo technology corridor (described as Canada's "Silicon Valley"), AI4Food operates within one of the country's most dynamic ecosystems for AI research, digital innovation, and agri-food entrepreneurship. This intersection of agri-food expertise, AI research capacity, and a growing network of start-ups and innovation partners provides a strong institutional foundation for AI4Food to act as a national hub for responsible AI development in the agri-food sector.

Through continued dialogue and coordination, AI4Food can help align diverse stakeholders around shared frameworks for fair data governance, leading on ethical AI development and use, and various aspects of interoperability. Participants consistently highlighted the need for consistent terminology, transparent data stewardship practices, and equitable benefit-sharing. By facilitating alignment in these areas, AI4Food can co-lead efforts to reduce fragmentation and lower barriers to participation, resulting in trusted and responsible adoption of AI solutions aimed at improving decision-making tools and robotic capabilities.

A coordinated approach to sector leadership by AI4Food can contribute to data standardization and harmonization as well as data benchmarking, thereby accelerating the development of robust decision support systems and digital twin applications. This would accelerate the timelines under which AI development may be achieved, relative to relying on a fragmented effort.

There is also an opportunity for leadership in building capacity and readiness across the value chain. The dialogues made clear that AI adoption must be human-centred and responsive to workforce realities. AI4Food can support collaboration among partners to identify skills gaps, share best practices in training and advisory support, inform policy to augment this support, and promote tools for integration into existing workflows. Aligning these efforts with federal priorities for AI talent development would strengthen their impact and relevance.

Ultimately, the National Dialogue series clearly demonstrated AI4Food's potential to connect collaboration with action. As a trusted convenor and clearing-house, AI4Food helps develop and

validate diverse AI solutions for the agri-food sector, including decision tools, robotics, and digital twins. These apply to critical areas like agriculture and food production, risk assessment, and supply chain management, improving food safety and security. AI4Food leads national and international initiatives. These efforts advance innovation, establish data spaces, build AI risk repositories, create comprehensive data and AI governance frameworks and toolkits, and promote data harmonization, benchmarking, and open access. AI4Food also guides the sector on ethical AI use, ensuring responsible implementation aligns with both sector needs and national priorities.

The Role of AI4Food:
Moving from Dialogue to Action

AI4Food's mission spans critical areas of AI impact, including precision agriculture, livestock systems, crop and soil management, food integrity and safety, supply chain optimization, climate resilience, and food processing efficiency. Through targeted, ongoing initiatives, AI4Food aims to collaborate with partners and stakeholders to foster an ecosystem that drives responsible, equitable, and coordinated AI integration across Canada's agri-food value chain.

To fulfill this mission, AI4Food is currently leading the following key efforts:

- ***Spearheading Agricultural Data Spaces & International Alignment:*** To combat data silos and improve overall data quality, availability, and ethical sharing, AI4Food has launched the Canadian Agriculture and Food Data Spaces initiative in collaboration with national partners. This work is integrated with international collaborations, notably through EU Horizon funding initiatives like the Agriculture of Data Consortium. The goal is for the Canadian data infrastructure to remain interoperable, secure, and aligned with leading global standards.

- ***Pioneering AI Governance & National Strategy****:* To build trust and navigate complex regulatory landscapes, AI4Food is spearheading the development of comprehensive AI governance frameworks and ethical guidelines tailored to the sector. A cornerstone of this effort is the creation of a dedicated agri-food AI risk repository and practical open-source compliance toolkits. The goal is to inform coherent national policies and ensure that AI deployment across Canada's food system remains responsible, human-centric, and aligned with emerging global regulations.

- ***Co-Creating and Validating AI Solutions for Agri-Food:*** By engaging a diverse network of stakeholders, including agri-food researchers, industry leaders, policy-makers, NGOs, Indigenous communities, and agri-food organizations, AI4Food aims to co-design and co-creates innovative AI solutions tailored to the sector's needs. These diverse applications range from advanced disease modeling, robotics solutions, production optimization to sustainability tracking and building resilient food supply chains.

- ***De-risking Innovation through Regulatory and Operational Sandboxes:*** To bridge the gap between research and real-world application, AI4Food is establishing controlled "sandboxes" in collaboration with strategic partners. These environments allow stakeholders to safely validate new policies, AI models, data-sharing agreements, and governance solutions before widespread deployment. Moreover, AI4Food aims to examine and co-develop an ecosystem for fair, open-source tools and shares best practices to ensure technological sovereignty and system integrity.

- ***Championing Data Harmonization, Benchmarking, and Open Access:*** To overcome the barriers of fragmented data, AI4Food actively promotes sector-wide data standards, harmonization, and benchmarking. Furthermore, by developing and advocating for open-access datasets and tools, AI4Food drives widespread innovation and adoption across the agri-food ecosystem.

- ***Tackling AI Ethics, Risk, and Governance:*** To build essential trust across the sector, AI4Food is rigorously examining the complex intersections of agri-food data sources, actors, AI technologies, and the evolving legal and regulatory ecosystem. Recognizing governance as a core thematic priority, a cornerstone of this effort is the creation of a dedicated repository for AI and data risks specific to agriculture and food applications. Paired with the development of practical toolkits and open-source governance tools, this initiative provides the sector with important resources to proactively identify and manage ethical and regulatory concerns.

- ***Developing a National AI and Data Strategy:*** AI4Food is leading the effort to develop a robust national strategy to proactively position Canada as a global leader in agri-food AI. This initiative focuses on building the foundational architecture required for success: interoperable data systems and clear governance frameworks for AI technologies. The goal is to align public policy, private investment, and academic research, ensuring data flows equitably to drive ethical, sustainable, and highly efficient AI application across the value chain.

- ***Championing Human-Centric Integration and Workforce Readiness:*** Recognizing that technology must serve the people who use it, AI4Food has established a dedicated research program focused on human-AI collaboration for the sector, specifically examining AI design principles and requirements for trustworthiness. Furthermore, in direct response to the sector's shifting labor demands, persistent shortages, and aging talent pool, AI4Food will develop targeted training and upskilling programs in partnership with its broader network.

- ***Fostering Collaborative Networks and Interdisciplinary Partnerships:*** AI4Food actively builds and strengthens national and international networks among researchers, industry, government, Indigenous communities, and producers. This initiative is central to driving interdisciplinary collaboration to facilitate knowledge exchange, and create shared platforms for addressing complex agri-food challenges.

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National Dialogue Events Details

First Event

National Dialogue on Artificial Intelligence in Agriculture and Food

Delta Hotels Guelph Conference Centre, Guelph, Ontario

October 24-25, 2024

The National Dialogue on Artificial Intelligence in Food and Agriculture, the inaugural event in this series, served as a premier platform for networking, exchanging ideas, and engaging in forward-thinking discussions related to AI's application within the agri-food sector. Hosted jointly by the AI4Food and the Centre for International Governance Innovation (CIGI), this event created an inter- and trans-disciplinary forum. It brought together a diverse array of agriculture and food experts, AI technologists, computer scientists, engineers, policymakers, entrepreneurs, and researchers to exchange experiences and discuss the AI-based transformation of Canada's agriculture and food sectors. Attendees had the opportunity to discuss the sector's strategic priorities, identify key requirements and challenges, and explore existing resources and funding opportunities.

Event Themes

- **Farm of the Future:** Data technologies drive innovation, efficiency, and scale in agricultural production
- **Food Safety:** Application of AI for enhanced inspection, contamination detection, predictive risk modeling, and supply chain traceability
- **Food Security:** Food availability, accessibility, nutritional quality, and safety, food waste, distribution challenges, and emergency preparedness
- **Governance of Data and Technology:** Data ownership, access, security, interoperability, ethical AI use, and the legal frameworks
- **One Health:** Interconnectedness of human, animal, plant, and environmental health
- **Sustainability:** Exploring how AI and data analytics can support environmental stewardship, optimize resource use, measure impact, and drive sustainable practices in agri-food production.

Co-Chairs

- **Dr. Rozita Dara**
  Professor and Co-Director of AI4Food, the University of Guelph
- **Tracey Forrest**
  Research Director of Transformative Technologies at CIGI

Organizers

- **Tarika Jain**
  Research Assistant, University of Guelph
- **Michelle Ragany**
  Research Assistant, University of Guelph
- **Anne Blayney**
  Senior Events Planner, CIGI
- **Erin Chreptyk**
  Program Manager, CIGI

Sponsors

- **CAAIN**
- **OMAFA**
- **School of Computer Science**
- **College of Engineering and Physical Sciences,**

Attendees

This event gathered more than 75 participants

Government, NGO & Public Sector: Agriculture and Agri-Food Canada (AAFC), National Research Council (NRC), Intellectual Property Ontario (IPON), Digital Governance Standards Institute, Ontario Centre of Innovation, Digital Research Alliance for Canada, ALUS, CropLife Canada, Chiefs of Ontario

Industry & Private Sector:Google Cloud Canada, Deloitte, Artarmon AI, Nutrien Ag Solutions, PrüvIT Technologies Inc, P & P Optica, Untether AI, CATTLEytics Inc, RHA Ventures Inc, Index Bio, Nature Fresh Farms, Maple Leaf Foods Inc, JM Farber Global Food Safety, McCain Foods, CSB System International, Finite Farms, Aspire Food Group

Research, Academia & Others: Vineland Research and Innovation Centre, Livestock Research Innovation Corporation, Conestoga College, The Conference Board of Canada, Canadian Agri-Food Automation and Intelligence Network (CAAIN), Canadian Food Innovation Network (CFIN), AgRobotics Working Group

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Centre for International Governance Innovation

Second Event

National Dialogue on Artificial Intelligence in Food Safety

Delta Hotels Guelph Conference Centre, Guelph, Ontario

October 1-2, 2025

The National Dialogue on Artificial Intelligence for Food Safety focused specifically on how AI technologies can strengthen inspection, contamination detection, predictive risk modelling, and supply chain traceability. Organized by AI4Food in partnership with the CFIA, the University of Guelph's RIO, and the OMAFA, the dialogue brought together regulators, food safety researchers, and industry practitioners.

Event Themes

- **Food Integrity:** Fraud detection, traceability, and supply chain transparency.
- **Food Quality:** AI-driven quality control measures, real-time monitoring, and data analytics.
- **Food Waste:** Using AI to optimize supply chains, reduce spoilage, and minimize food waste.
- **Food Supply Chain Resilience:** Enhancing system resilience through predictive analytics and risk modeling

Attendees

This event gathered more than 90 participants

Government & Public Sector: Agriculture and Agri-Food Canada (AAFC), Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA), Canadian Food Inspection Agency (CFIA), Wellington-Dufferin-Guelph Public Health, Farm Credit Canada

Industry & Private Sector: Walmart Canada, McCormick Canada, CSB-System, LABPLAS, Maple Lodge Farms, Cultivate SA, Neogen, SVG Ventures, Sofina Foods, Gay Lea Foods Co-operative, Loblaws, Haven Greens, Unilever, Merieux Nutrisciences, Food and Beverage Ontario

Research, Academia & Others: University of Guelph, Wageningen University & Research, McGill University, McMaster University, National Research Council Canada, Vineland Research and Innovation Centre, Rutgers University, The Conference Board of Canada, National Sanitation Foundation

University of Guelph | Research Innovation Office | AI4Food Artificial Intelligence for Food

Agence canadienne d'inspection des aliments | Canadian Food Inspection Agency

Ontario

Co-Chairs

- **Dr. Rozita Dara** Professor and Co-Director of AI4Food, the University of Guelph
- **Dr. Maria G. Corradini** Professor and Arrell Chair in Food Quality, Arrell Food Institute, University of Guelph
- **Dr. Magdy ElDakiky** Manager, Protection Programs and Partnerships Unit, Ontario Ministry of Agriculture
- **Jessica Bows** Assistant Vice-President, Research, Innovation & Knowledge Mobilization, University of Guelph
- **Noureddine Meraihi** Manager, AI-Lab, Canadian Food Inspection Agency

Organizers

- **Tarika Jain** Research Assistant, University of Guelph
- **Michelle Stringer** Project Coordinator, Research Innovation Office at University of Guelph
- **Jennifer Kucharczyk** Team Lead, Food Safety Programs Unit, OMAFA

Sponsors

- **School of Computer Science**
- **College of Engineering and Physical Sciences,**

Third Event

National Dialogue Artificial Intelligence and Data Sovereignty in Agri-Food

Virtual Event

November 21, 2025

The third National Dialogue focused on AI and Data Sovereignty in Agri-Food, specifically examining foundational questions related to data ownership, access, security, interoperability, and national digital infrastructure. This online event aimed to comprehensively explore the challenges and needs for Canada concerning AI and data sovereignty within agriculture and food systems. Discussions extensively addressed persistent challenges, including the imperative for standardized data and terminology, the complexities of inter-jurisdictional data sharing, the intricacies of provincial–federal coordination, and the critical task of establishing trust among stakeholders who grapple with privacy concerns, alongside ensuring robust and secure digital infrastructure across the sector.

Co-Chairs

- **Dr. Rozita Dara**
  Professor and Co-Director of AI4Food, the University of Guelph
- **Felipe Pérez-Jvostov**
  Director, Strategic Development and Initiatives, Digital Research Alliance of Canada

Attendees

Participants included representatives from CFIA, AAFC, the Digital Research Alliance of Canada (DRAC), start-ups, governance and standards organizations, and academic experts in AI and data policy.

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Ackowledgement

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