# POLICY BRIEF

## ASSESSMENT OF AI TECHNOLOGY ADOPTION IN ONTARIO: CONTENT LAYER CLASSIFICATION

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## CONTEXT

Digital technologies, including AI, are transforming Canadian agriculture, especially in Ontario's horticulture and livestock sectors, by providing increased crop yields, lower labor costs, and improved efficiency. In horticulture, smart systems optimize post-harvest quality by monitoring storage conditions, minimizing waste, and extending shelf life (Farmonaut, 2024; GECO Engineering, 2025). In livestock, AI forecasts milk production, improves calf nutrition through automated feeding, manages movement via GPS-enabled virtual fencing, and increases breeding efficiency (DeLaval, 2025). AI technologies in these sectors share fundamental features like sensors and monitoring systems but their application aligns with unique variations in operational priorities and decision-making processes.

Since producers carefully choose technologies that fulfill their farm needs, policies should be designed to encourage the adoption of technologies that align with these objectives.

Püschel (2016) suggests that organizing digital technologies into a structured taxonomy helps clarify their roles in supporting data analytics and decision-making. This brief explores the characteristics of AI technologies in Ontario's horticultural crop and livestock sectors, as understanding these technology features can inform strategic policy interventions.

**TABLE 1 : CONTENT LAYER CLASSIFICATION OF AI TECHNOLOGIES & ADOPTION**

| S/N | Content Layer Classification of AI Tech. | Analytical Function | Examples | Possible Adoption Barriers | Potential Drivers |
|---|---|---|---|---|---|
| 1 | Descriptive | What is happening? | Soil health Monitoring | Data variability, lengthy data processing time, lack of interoperability | Standardized data formats, reliable broadband infrastructure, technical assistance |
| 2 | Diagnostic | What problems exist? | AI Sensors for respiratory disease detection | May require technical expertise, data privacy concerns | Availability of Skilled labor, Advisory support, Knowledge sharing opportunities |
| 3 | Predictive | What might happen? | Milk yield prediction | High costs, risk of environmental damage due to unreliable data | Demonstrated benefits, financial incentives, and training support |
| 4 | Prescriptive | What can be done? | Automated irrigation systems | High upfront costs, lack of trust in recommendations | Appropriate regulatory framework, transparent data practices, policy incentives |

*Adapted : (Dara et al., 2022; Hall et al., 2024; Leeuwis & Aarts, 2011; Lemay & Boggs, 2024; Njuguna et al., 2025; Püschel, 2016; van Hilten et al., 2025)*

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## ASSESSING SPECIFIC AI TECHNOLOGY CHARACTERISTICS

### What is it?

The content layer classification of AI technologies describes value creation using descriptive, diagnostic, predictive, and prescriptive analytic functions. Descriptive analytics collect and store raw data, diagnostic analytics, like AI sensors for respiratory disease detection, analyze causal factors to identify issues such as nutrient deficiencies. Predictive analytics anticipate future trends and risks, enabling farmers to plan for challenges like disease outbreaks or climate shifts. Prescriptive analytics optimize farm operations by recommending actions or automating processes, (Njuguna et al., 2025)

### Why is it important?

Adopting AI tools in agriculture also depends on the specific functions these technologies perform, meaning that each content layer provides an opportunity to understand the technology characteristics and the challenges better. This could lead to a targeted policy approach to better facilitate the integration of AI in agriculture

## What Policy Approaches are Needed?

### Descriptive Technologies

Poor rural connectivity can hinder the use of AI-driven soil and crop health monitoring technologies, limiting real-time data transmission. Policies should invest in expanding rural broadband and cellular coverage. Offline platform options will enable farmers to utilize these technologies to collect and process data in areas with low connectivity.

### Diagnostic Technologies

Diagnostic technologies, which identify issues on the farm, may face compatibility challenges as older equipment may not be compatible with modern AI diagnostic tools. Policies should also offer subsidies or tax incentives to help farmers upgrade to AI-compatible equipment.

### Predictive Technologies

Predictive analytic tools rely heavily on historical data to forecast the future; however, a lack of reliable or standardized datasets could pose problems. Standardization efforts should aim to increase data reliability for predictive analytics. Data collection and sharing policies must also safeguard farmers' rights and promote transparency, as AI tools should enable farmers to adopt new solutions without being restricted to proprietary systems.

### Prescriptive Technologies

Producers may hesitate to rely on AI recommendations if they don’t understand or trust the technologies. Additionally, they may be reluctant to share farm data if data governance policies are poorly defined. Legal frameworks for liability protection can ensure accountability and reduce risks. Policies that facilitate AI literacy programs are also essential to build trust.

## *PROMOTING INTEGRATED AI TECHNOLOGIES*

### What is it?

While AI technologies in Ontario can be evaluated based on their specific functional characteristics, technological features can also be integrated with each layer, building on the previous one. For instance, data collected by descriptive analytics tools, such as those on crop conditions, can be refined by diagnostic tools to identify issues like nutrient deficiencies. Predictive analytics can use the diagnostic data to forecast risks and trends, such as pest outbreaks. Finally, prescriptive systems leverage these insights to recommend timely actions, like pesticide applications. While integrated solution technologies are available in Ontario (Farmonaut, 2024; Hall et al., 2024), additional opportunities exist.

### Why is it important?

AI technologies that incorporate all content layer characteristics offer significant opportunities for farmers to access comprehensive solutions.

### What Policy Approaches are Needed?

### Interoperability

Despite the inherent technical complexities, maximizing the potential of AI in agriculture requires policies that promote connectivity among AI systems. Policy should also reduce system complexities and improve the user-friendliness of AI technologies.

### Financial Support

Accessible financial incentives such as subsidies and grants can help offset the high costs of infrastructure upgrades. These direct financial interventions reduce upfront expenses and lower risk, making it easier for producers, especially those in rural areas, to adopt and integrate AI technologies.

### Developing Technical expertise

The assessment of AI technologies must consider potential impacts on labour and the need for training and support for farmers. Policymakers should prioritize strategies that ensure the development of technical expertise, equipping agricultural workers with the skills needed to adapt to new roles and thrive in a technology-driven environment

### Data Governance

Robust data governance mechanisms should build data literacy while addressing privacy and security concerns to strengthen trust in AI and support adoption. Clear guidelines and regulations must also promote transparency and accountability in the development and testing of AI systems.

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## CONCLUSION

Assessing AI technologies in Ontario's horticultural crop and livestock sectors provides an additional perspective for ensuring that innovation meets the needs of producers, ultimately facilitating the adoption of these technologies. Two key policy approaches exist: one focuses on directly supporting farmers in adopting integrated AI technologies, and the other identifies specific barriers based on the characteristics of AI technologies. By prioritizing these approaches, policymakers can harness the full potential of AI in agriculture, increasing productivity, sustainability, and long-term adoption.

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