

Disruptive technologies in the agricultural sector: Evidence from Ontario

OMAFRA Research In Action: Ontario AgRobotics - Cultivating Tomorrow
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Context

Robots invading farms as part of revolution of agriculture industry

Ag stakeholders talk keeping up with new innovations in streamlining farm production



Lindsay Kelly
Feb 24, 2024 5:58 PM



Government of Canada invests in adoption of precision agriculture technology for local Verner farm

From: [Agriculture and Agri-Food Canada](#)

News release

August 16, 2023 – Verner, Ontario – Agriculture and Agri-Food Canada

NEWS

Farmers embracing technology, sustainable practices and direct-to-consumer sales

Posted on 19 May 2022 in News

Robots milking cows on almost 20 per cent of Canadian dairy farms

Play Video

March 28, 2023 by RealAgriculture Livestock Team



Ontario Tech's entrepreneurship ecosystem helps secure \$1 million grant to investigate winter season food production in Canada

BRILLIANT CATALYST AT ONTARIO TECH CONNECTS LOCAL BUSINESS STARTUPS WITH RESEARCH EXPERTISE TO PRODUCE INNOVATIVE, REAL-LIFE SOLUTIONS

October 24, 2023

Farm to Fork: Growers look to tech to de-risk farming in the North

Panelists share challenges, opportunities involved with Northern Ontario horticulture practices



Lindsay Kelly
Nov 3, 2023 12:00 PM



Canada needs to accommodate spray drones



By Kevin Hursh

Published: April 18, 2024
Opinion

Reading Time: 2 minutes



Project Overview

1 What is the nature and extent of disruptive technologies in the Ontario ag context?

2 How are these disruptive technologies reshaping the sector?

3 What is driving adoption of these disruptive technologies?

4 What are the impacts on rural regions and responses by stakeholder organizations?

Mixed Methods Approach

Knowledge Synthesis

Exploring historical shifts, current trends, and a discussion of the drivers, barriers, and impacts of technology adoption on farms and stakeholders in rural communities

Novel Dataset

Creation of a novel dataset of **247** Canadian agricultural technology organizations to explore the national AgTech landscape

Interviews

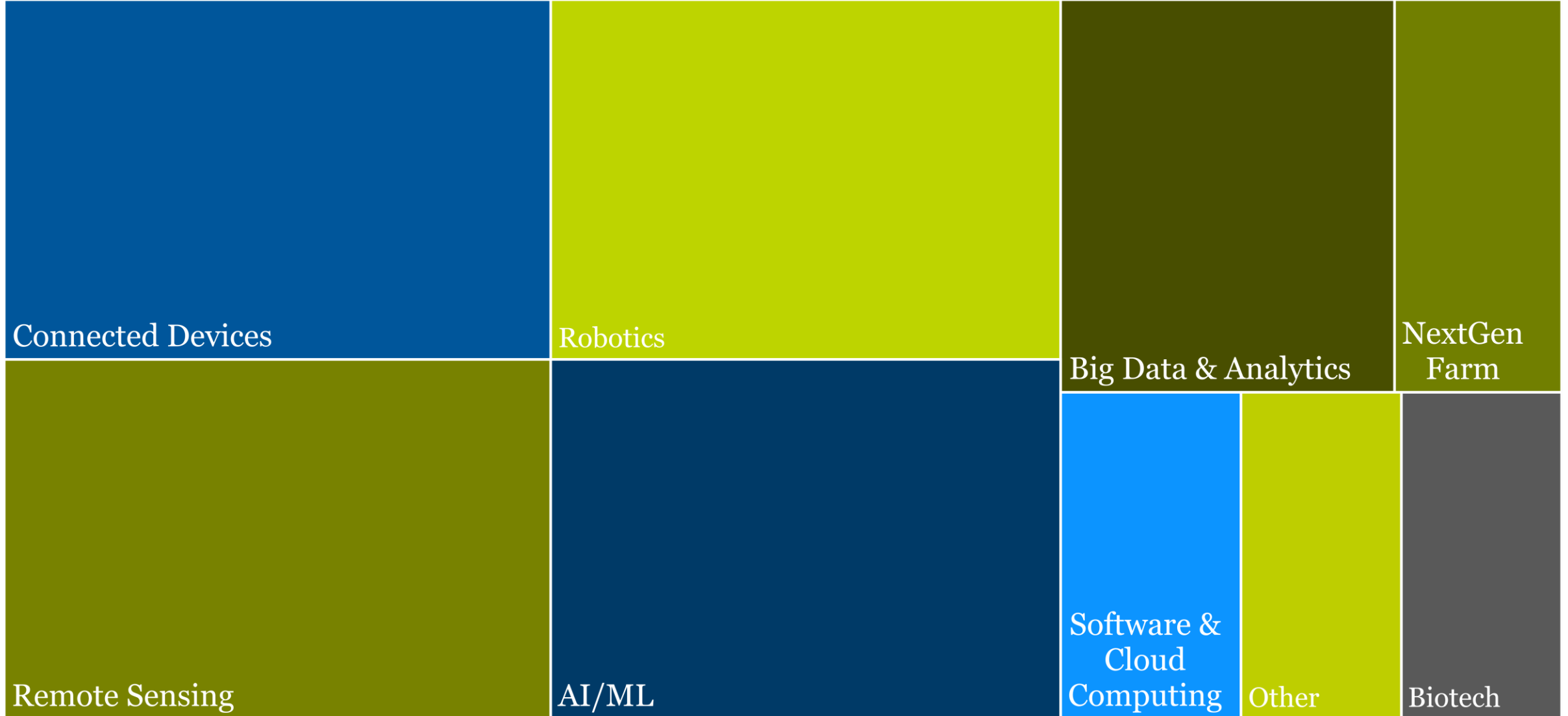
Qualitative research consisting of **48 key informant interviews** with 52 key informants including agricultural industry experts, agricultural-related technology companies, and agricultural business experts

Case Studies

Series of **AgTech case studies** exploring specific technologies and their potential impacts on rural development

TECHNOLOGY ADOPTION

Top Technologies – Adopted Last 5 Years



Drivers of Technology Adoption

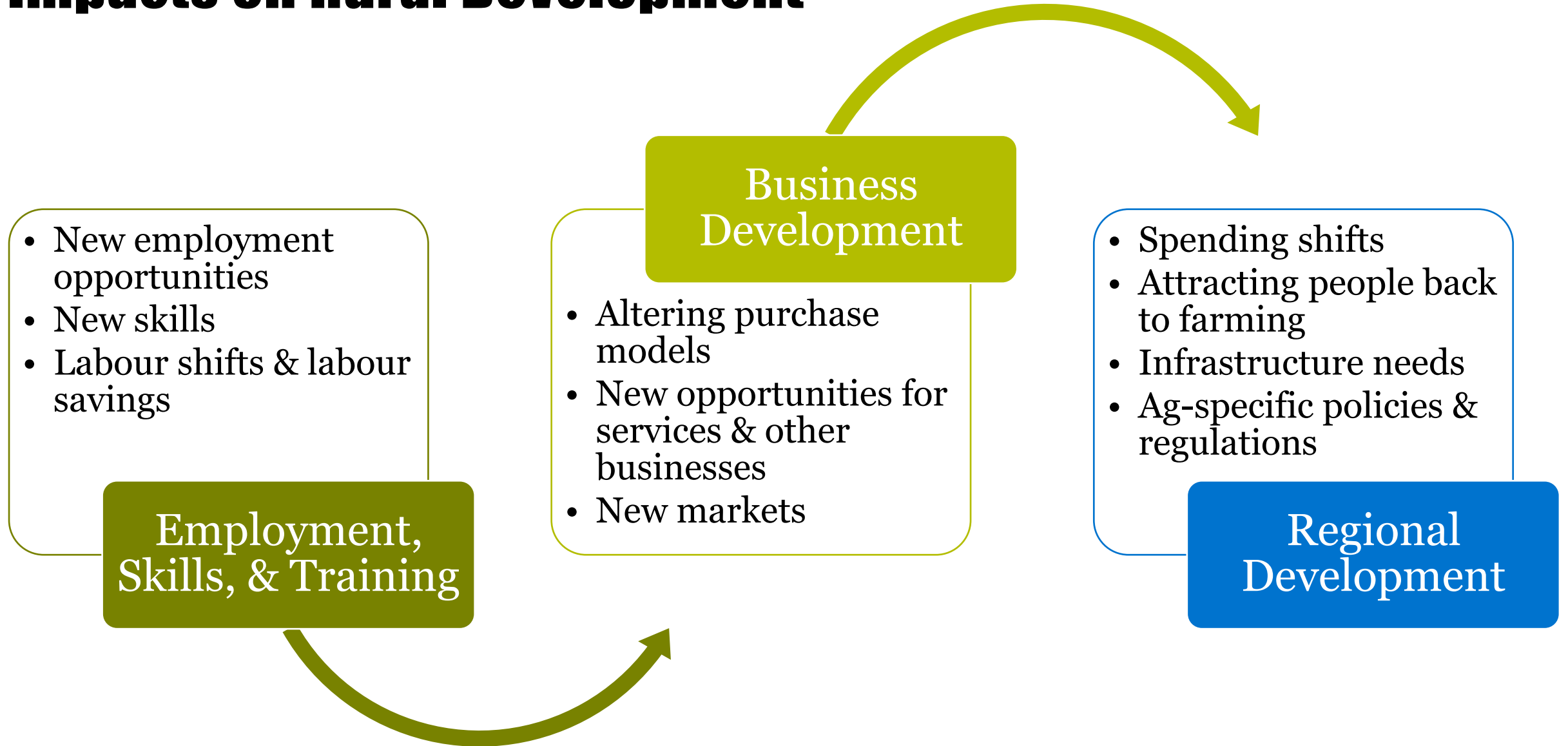
Economic Drivers		Labour Drivers		Plant Drivers	
Increase efficiencies	Reduce input costs	Labour challenges		Optimize plant & soil health	Address weed, disease & pest resistance
	Reduce fuel & energy costs				
Increase production	Compete more effectively	Improve quality of farm work	Improve quality of life for farmers	Other	
				Environmental sustainability	Respond to regulatory requirements

Barriers to Technology Adoption

Technology			Costs	Trust		Skills
Adaptation for farm use		Usability	Upfront investment costs	Skepticism	Risk & uncertain...	New tech skills
Cybersecurity & data privacy concerns	Connectivity	Technolo... mismatch				
		Limited time to test or setup		Interoperabi...	Data sharing	Access to financing
						Canadian market size

IMPACTS

Impacts on Rural Development



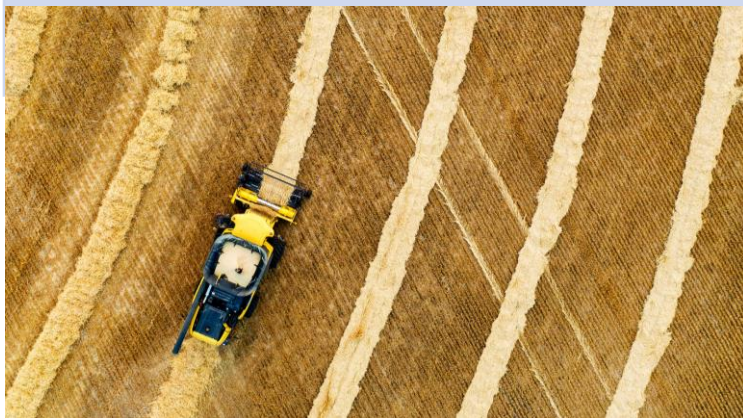
AG ROBOTICS

Robot Applications in Ontario Agriculture

Deployment across the province's food production sectors

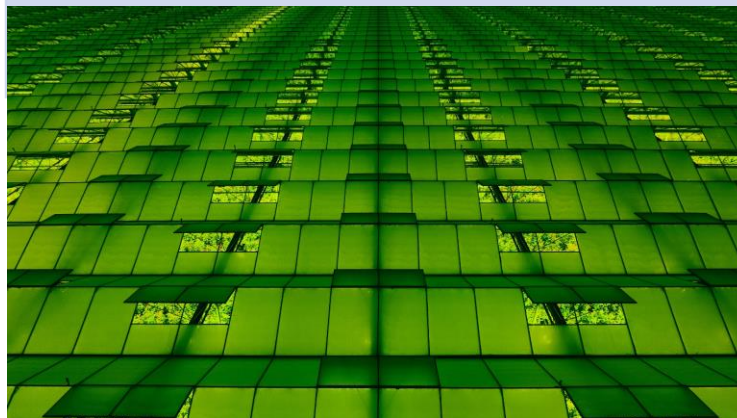
Field & Orchard

- Planting
- Weeding
- Mowing
- Grafting
- Precise application of fertilizer
- Crop assessment & grading
- Harvest prediction
- Harvesting



Controlled Environments

- Planting
- Nutrient supply
- Irrigation
- Air flow
- Pruning
- Weeding
- Crop assessment & grading
- Harvesting



Dairy & Livestock

- Feeding & watering
- Milking
- Milk processing
- Animal health monitoring



Robotics Impacts: Employment Skills and Training

“But the issue with the labour savings technologies is that [...] it doesn't necessarily eliminate a job because workers are doing lots of jobs. So, you know, if you're in a greenhouse and you bought the robotic picker, those workers would still be needed to do packing.” (Ag Industry Expert 3)

“[...] robots don't get sick. They show up on time, you know. That's a big piece of it.” (Ag Industry Expert 11)

“[...] And so instead of having to say pick an apple and then bend over and place it in a basket. And then drag the basket or cart forward or have a second person drive it. This basket would be on an automated cart that would follow the user [...] So that makes it a little bit easier [...] on their back and any kind of twisting motion or activity that the worker needs to subject themselves to ...” (Ag-Related Tech Company 13)

Robotics Impacts: Business Development

“We have purchased the robots ourselves. We've taken that risk. And I found customers to rent them and then if they rent them, then, you know, we kind of get our money back over time.” (Ag-Related Tech Company 1)

“In the case of robotic milking, I think we're not necessarily seeing growth in more of the robotic providers, but I think that all of the services that support bringing that into your farm situation. So the barn builders, the engineers, the designers, all of the various pieces that go along with bringing that in. Because [...] I can't think of a scenario where you just have a barn that's ready to go and you plunk the robotic milker in. It's usually incorporated in an entirely new build or certainly a significant renovation. So there's a whole piece that comes along supporting that.” (Ag Industry Expert 2)

Robotics Impacts: Regional Development

“[Students] come back with a whole different view that agriculture doesn't have to be dirty and [...] it doesn't have to be toiling in the sun. It can be fun.” (Ag-Related Tech Company 2)

“In terms of emissions, there's a huge saving. So the cost of fuel as high as it is. Our robots typically only use one to \$2 of electricity a day. The full charge. And that helps. That really helps because [...] when farming pretty much everything is diesel right at low speed. Any internal combustion engine is very inefficient. [...] They produce a lot of pollution, because they have to run much faster to generate a little more torque, but at low speed.” (Ag-Related Tech Company 2)

“For instance, the policies regarding or regulations regarding having an autonomous vehicle move from field to field, especially if they need to cross a public road in order to get to the next field. And so once it touches a public road, then a different set of rules would apply. So that's the type of policy infrastructure that need to be put in place.” (Ag Industry Expert 18)

RESPONSES

Responses to Rural Development Impacts

- [Bioenterprise](#)
- [Homegrown Innovation Challenge](#)
- [Vineland Research & Innovation Center](#)

Private Sector

Governments

- [The AgriInnovate Program](#)
- [AgRobotics Working Group](#)

- [Ontario Agri-Food Innovation Alliance](#)
- [Smart Farms Network](#)
- [Palette Skills](#)
- [Greenhouse Technician Program](#)

Postsecondary Institutions

Industry Associations

- [Canadian Food Innovation Network](#)
- [Careers in Ag](#)

FUTURE CONSIDERATIONS

Future Considerations for Tech & Rural Development

Ag Technologies

Increases in robotics and automation, especially modular systems

Growing emphasis on AI/computer vision paired with robotics, cloud computing, and IoT

Increased interest in machine learning and predictive analytics



Rural Development Impacts

New tech adoption will lead to a transition from low-skilled work to higher-skilled work

Labour and sustainability considerations will drive tech adoption

Opportunities for improving environmental impact and sustainability, competitiveness, and lifestyle/welfare of farmers

Thank you

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