Disruptive Technologies in the Agri-Food Sector

A Knowledge Synthesis

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- Phase 1: Knowledge Synthesis
  - First phase of a larger project funded by the New Directions Research Program (OMAFRA)

- Project Approach
  - Technology assessment, key informant interviews and comparative case studies
  - Examine the social and spatial dimensions of disruptive technologies
  - Explore how regional stakeholders are responding to these impacts

- Goal of this research
  - Advance understanding of the challenges and opportunities associated with the adoption of disruptive technologies in the agri-food sector

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Project Overview

Project Approach, Goals & Current Phase

Research Gaps

Current Research

- Focus on productivity & efficiency increases
  - Current literature focuses on explaining trends, as well as barriers and motivations for technology adoption
  - Business drivers motivating the adoption of digital tech (e.g., more efficiency and improved management control with smart tech, drones, automation)
  - Suggests farmers are prepared to invest in tech that has a proven operational benefit that can increase efficiency and effectiveness

Gaps in Literature

- Impacts of technology adoption on farms and responses by stakeholders in rural communities
  - Little academic and policy research examining **how disruptive technologies interact with and are impacting** people and the communities in which they operate - rural workers and rural communities

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Findings

Historical and technological shifts in the agri-food sector

Historical and technological shifts

- **Agri-Food 1.0** (19th century) – industrialization of food processing – shift towards the mechanization and steam-engine power

- **Agri-Food 2.0** (1950's) – use of electrical machines increasing production capacities & "green revolution"

- **Agri-Food 3.0** (late 20th century) – digitalization of processes – i.e., advances in robotics and automation

- **Agri-Food 4.0** (present) – use of ICTs, smart technologies, & IoT led to emergence of precision production systems

Disruptive technologies

- Advanced technologies are reshaping and disrupting the agri-food sector in Canada and internationally

Key digital agriculture trends:

1) Internet of Things (IoT): Field and equipment sensors

2) Drones and Crop Monitoring

3) Farming Robotics and Autonomous Transport

4) Radio frequency identification (RFID) sensors and Tracking

5) Machine Learning and Analytics

Photo credit: "Flying quadcopter drone agriculture farming" by ackab1 under CC BY-SA 2.0

Findings

Overview of disruptive technologies and current trends

Photo credit: New York Times

Findings

Drivers for technology adoption

Drivers for Technology Adoption

Interest in agri-food tech is being driven by several broad global trends:

1) Population Growth

2) Responding to Climate Change

3) Food Loss and Food Waste

4) Global Competition

Photo credit: Heather Hall

Findings

Barriers and impacts of technology adoption on farms and stakeholders in rural communities

Barriers and Impacts of Technology Adoption

1) Lack of rural broadband connectivity

2) Limited knowledge of new technologies

3) Implementation costs

4) Technical expertise requirements

5) Concerns over privacy and security of food systems data

6) Potential decline of farm level employment

7) Questions over who benefits

Next Steps

The next phases will focus on data collection and knowledge mobilization

Phase 1 Knowledge Synthesis	Phases 2-3 Data Collection & Analysis	Ongoing Knowledge Mobilization
• Scoping review of the academic and policy literature • Identify current trends and knowledge gaps	• Technology assessment • Interviews with key informants • Comparative case studies • Data Analysis	• Sharing back what we heard through presentations, reports and papers

Impact & Value

Capstone & Career Preparation

- Completion of capstone project/degree requirements

- Career development and preparing for future work

Diversification of Knowledge

- Diversify knowledge and interest in technology adoption

- Understanding the impacts of technologies on community well-being, economic and social needs

Thank You

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🌐 uwaterloo.ca/disruptive-technologies-ecdev