

Canada's

# VENTURES TO VALUE CHAINS

AGRI-FOOD TECHNOLOGY

JANUARY 2024



FORESIGHT  
CANADA



# ACKNOWLEDGEMENTS

Foresight acknowledges that the lands on which we conducted this work are the traditional, ancestral, and unceded territories of the xwməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and səlilwətał (Tseil-Waututh) Nations.

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# Foresight is Canada's cleantech accelerator.

Foresight is Canada's cleantech accelerator. We bring together innovators, industry, investors, government, and academia to address today's most urgent climate issues and support a global transition to a **green economy**.

## ABOUT

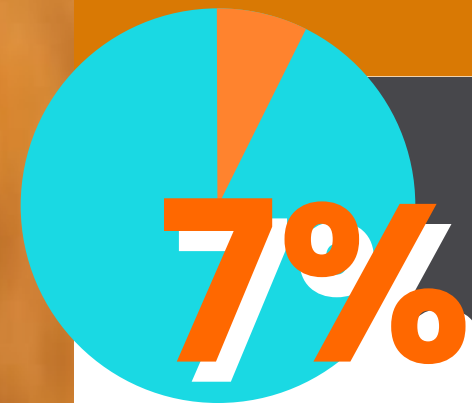


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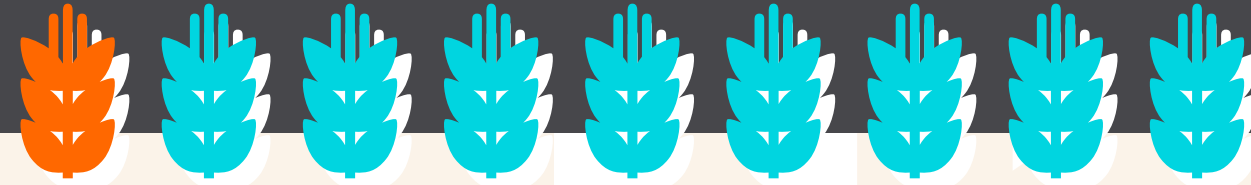
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# INTRODUCTION

THE AGRICULTURE AND AGRI-FOOD SECTOR IS A VITAL DRIVER OF ECONOMIC ACTIVITY IN CANADA.



IN 2022, THE SECTOR EMPLOYED ONE OF EVERY NINE CANADIANS AND WAS RESPONSIBLE FOR SEVEN PER CENT (~\$144 BILLION) OF GDP.<sup>1</sup>



In order to secure long-term prosperity for the sector, increased focus on research, development, and commercialization of agri-tech will be needed. Agri-tech, defined in BC as “the fusion of innovation and technology applied to the agriculture, food processing, and seafood sectors”, can help build resiliency, transparency, and security throughout Canada’s food supply chain while boosting productivity.<sup>2</sup>

The Guelph Statement, a shared vision by Canada’s agricultural ministers, laid the foundation for the sector’s medium-term priorities and focus areas, including “science, research, and innovation”.<sup>3</sup> This vision laid the groundwork for the 2023 renewal of the Canadian Agricultural Partnership (CAP), known as the Sustainable CAP, which unlocked \$3.5 billion of joint funding for the sector.<sup>4</sup> The Sustainable CAP supports numerous provincial and federal programs funding technology development and innovation, including the Agricultural Clean Technology (ACT) program (funds research and development activities and the adoption of commercial technology),<sup>5,6</sup> the AgriInnovate Program,<sup>7</sup> and the AgriScience Program.<sup>8,9</sup>

While Canada has yet to release a national agri-tech strategy, the federal government has supported independent thought-leadership on the subject and Agriculture and Agri-Food Canada is currently developing a national “Sustainable Agriculture Strategy”, which will involve long-term planning related to agricultural research and innovation.<sup>10,11</sup> Agriculture and Agri-Food Canada’s 2022 Strategic Plan for Science, while high-level in nature, is perhaps the most recent long-term document providing an outlook for the future and offers insights on the role technology can play in the agri-food sector’s evolution in a world with rapidly changing agricultural needs.

Experts have called for an agri-tech innovation strategy to prioritize the localization of food supply, technology-enabled regenerative agriculture, and labour force recruitment and retention.<sup>12</sup> Foresight’s work to map technology innovators in the agri-food sector attempts to inform such a strategy by illuminating where Canadian companies are already contributing to these goals (e.g. controlled environment agriculture (CEA) or precision agriculture technologies). This edition of Foresight’s Ventures to Value Chains initiative aims to provide insights to our Helix 5™ partners on perceived areas of strength for Canada as well as opportunities for growth, by leveraging data we have collected on Canada’s agri-tech companies.



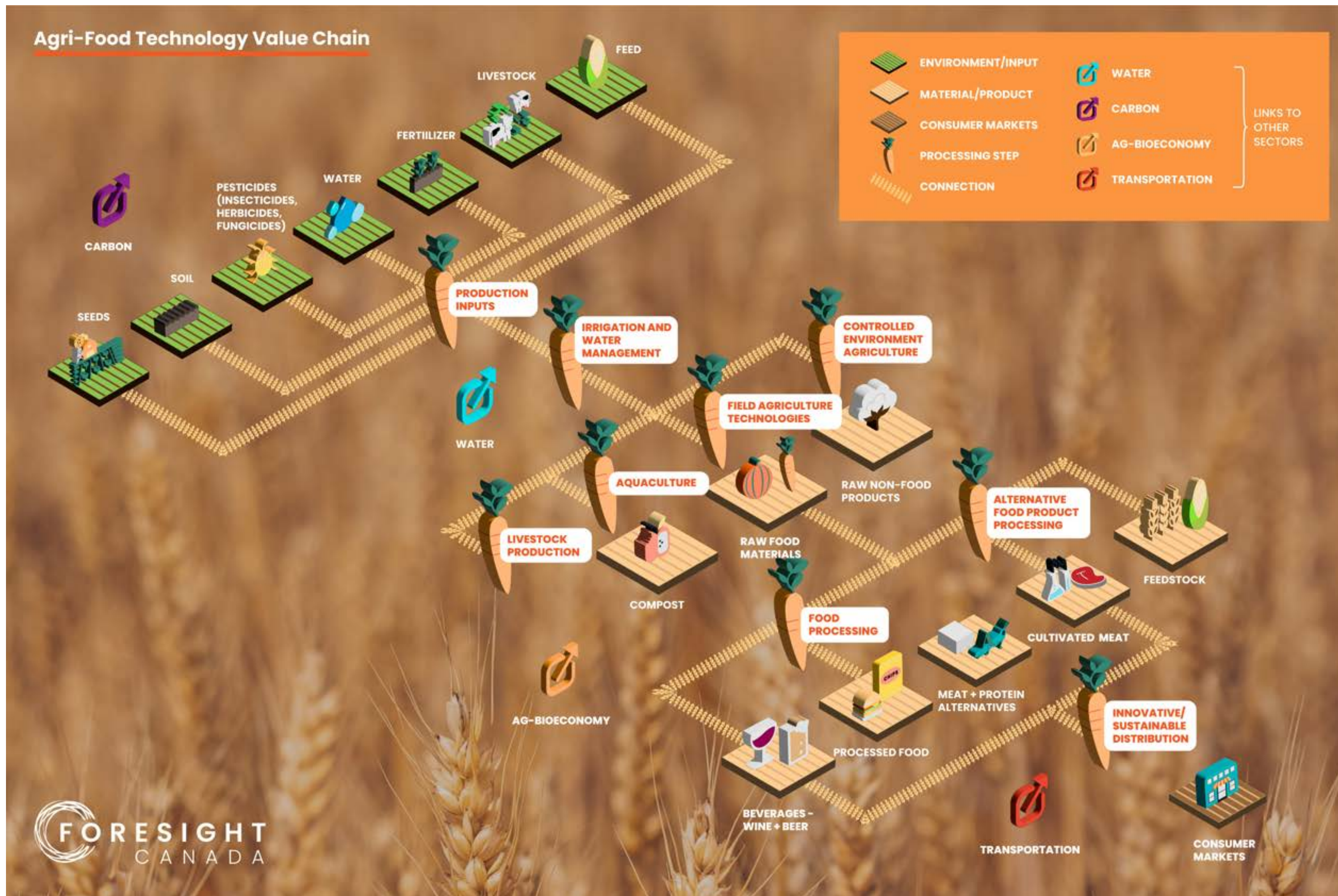
# RATIONALE

## VENTURES TO VALUE CHAINS

is a Foresight initiative that leverages data from technology companies and other key stakeholders to map and categorize strategically important industry value chains for Canada in the clean economy.

This initiative will result in a searchable database, which can be used as a tool to inform stakeholders on Canada's competitive strengths, ecosystem gaps, and areas of opportunity and growth. These insights can identify where targeted programming, research and development, or funding will bolster Canada's leadership and economic development as we transition to a clean economy and net zero emissions.

# AGRI-FOOD TECH: THE VALUE CHAIN



The value chain (Figure 1) describes the journey of agricultural inputs to a number of processing steps and the ways in which they connect to inputs, outputs, and end points such as users, markets, or the environment.

**Figure 1** Value Chain

<sup>1</sup> While these are labeled as processing steps, they include both processing (e.g., treatment) and other types of actions within the value chain (e.g., use). For definitions of each of the processing steps, see Appendix A.



# METHODOLOGY

**This research was conducted by mapping Canada's agri-food ecosystem, categorizing companies based on the processing steps outlined in the value chain, and analyzing how the companies were distributed across the value chain.**

The agri-food value chain database comprises companies, enablers, and knowledge generators within the ecosystem. The value chain mapping and analysis focused on companies that fit within the following criteria:

- 🌱 Involved in tech innovation, research, or development in some capacity. In some cases, this is their primary focus, while for others, this is a component of a larger portfolio of services.
- 🌱 Excluded, based on the first set of criteria, are suppliers, distributors, service providers, and consulting firms.
- 🌱 Companies must either be headquartered in Canada or have a strong Canadian presence that includes research and innovation.

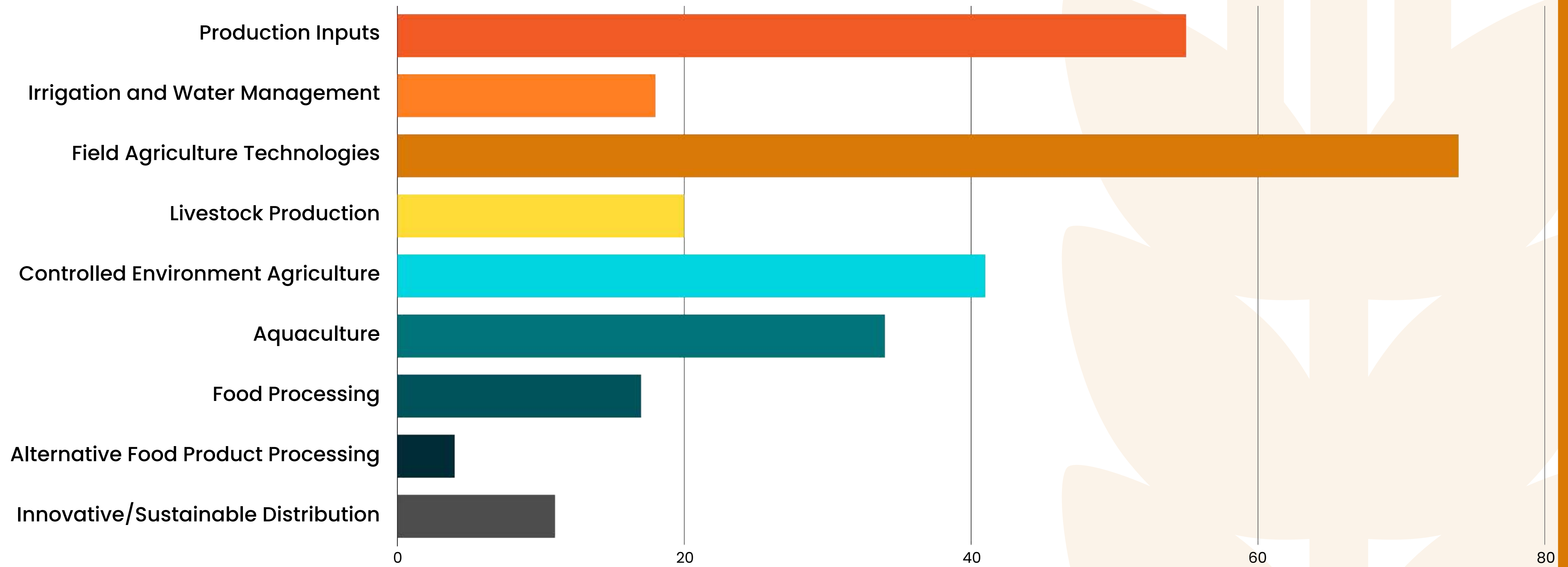
Companies were categorized to up to two value chain steps based on their innovation focus then analyzed to identify both regional and national trends. Secondary research was used to provide additional context to the trends.<sup>2</sup> Because the data can only indicate clustering and concentrations, and not why trends exist, observations are communicated as:

- 🌱 **Areas of strength:** Areas where the data and supporting research suggests that the agri-tech sector is doing well and should continue to maintain.
- 🌱 **Opportunities:** Areas where the data and/or supporting research suggests that there is an opportunity for growth to help meet the need for agricultural innovation and climate solutions.

<sup>2</sup> The key functional classification used to better distinguish within categories was based on the climate adaptation technology (CAT) framing and taxonomy, which is the intellectual property of Mazarine Ventures LLC, available to all under the Creative Commons (CC) license. It distinguishes between technologies that address (effect change), analyze (interpret, understand trends), and observe (measure and monitor). For more detail on the methodology, see Appendix B.



# **CANADA'S** AGRI-FOOD TECH COMPANIES



**Figure 2**

Distribution of agri-food tech companies across the value chain processing steps.

267

COMPANIES WERE ASSIGNED TO CANADA'S AGRI-FOOD TECH VALUE CHAIN, REPRESENTING

~13% OF THE OVER 2000

CANADIAN CLEANTECH COMPANIES IDENTIFIED BY NATURAL RESOURCES CANADA IN 2022.<sup>13</sup>

The companies are highly concentrated in the four largest provinces and among "processing" steps of the value chain. The leading VC steps were: **Field Agriculture Tech, Production Inputs, Controlled Environment Agriculture, and Aquaculture**. The leading provinces were **Ontario, BC, Alberta and Québec**.

Key insights from the Mazarine classification (see footnote 2) exercise include:

- 57% (153) of companies classified as "Address"
- 25% (68) of companies classified as "Observe/Analyze"

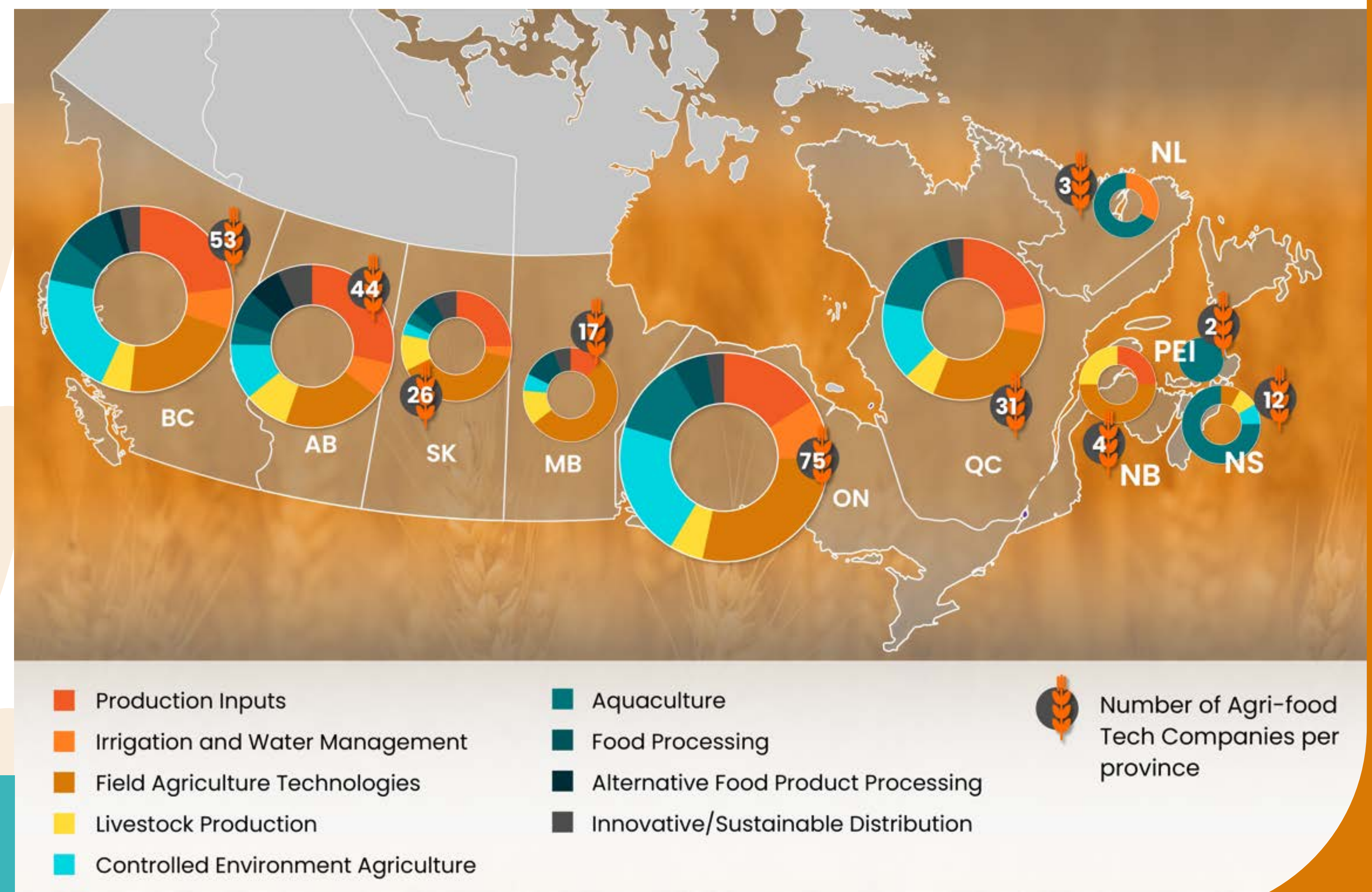


Figure 3 Canada's agri-food technology companies



# **DEEP DIVE:** **PROVINCIAL TRENDS**

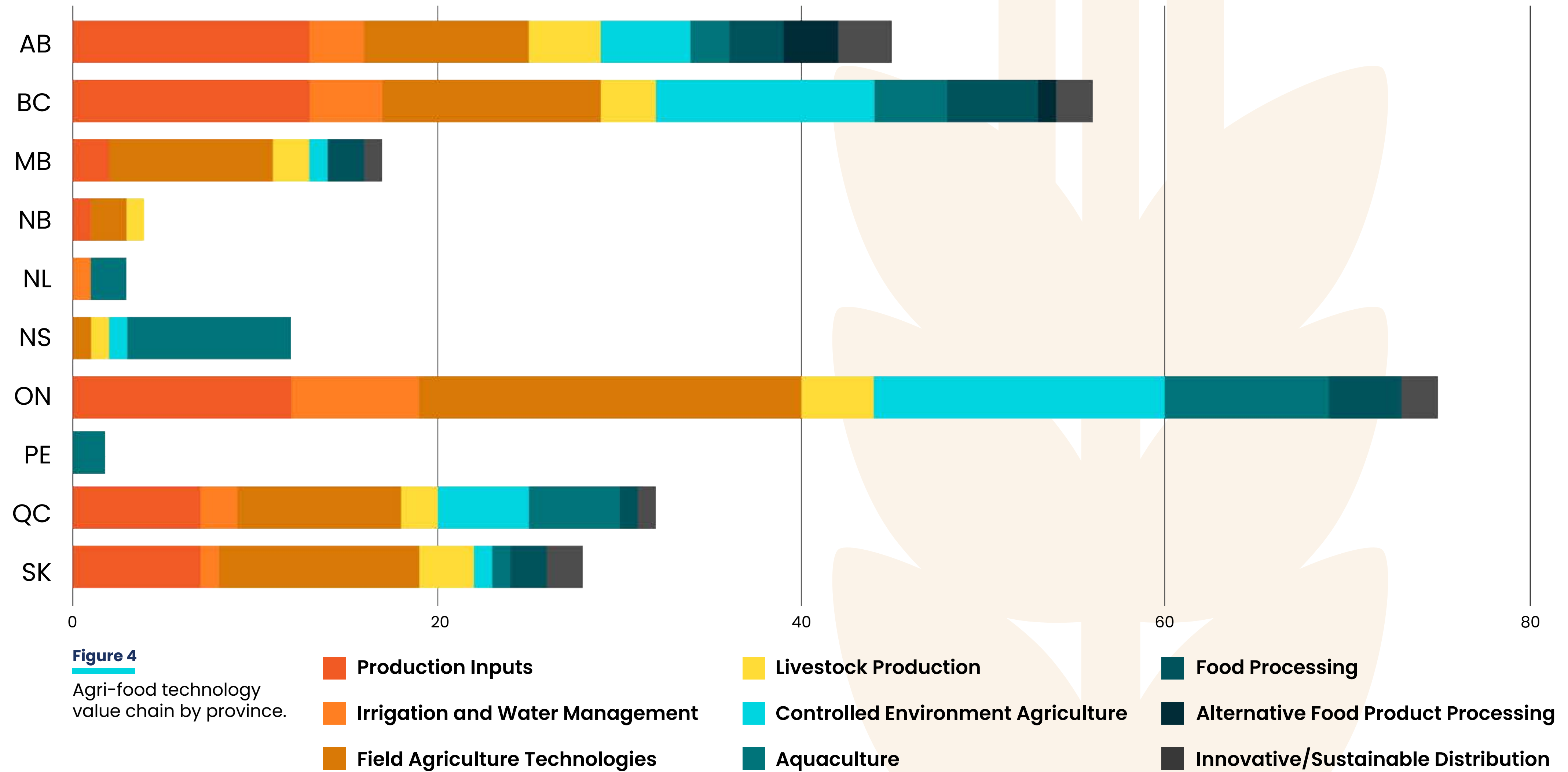
## THIS SECTION COVERS KEY TAKEAWAYS BASED ON AREAS OF STRENGTH AND CLUSTERING ACROSS THE PROVINCES.

Not every VC step is covered in every province, which is to be expected. Many of the companies, even if headquartered in one of the more densely populated provinces, likely serve other provinces and territories. Some value chain steps represent niche or emerging areas that will develop organically where there is a higher population or need.

# SUMMARY

- 📍 Ontario leads all provinces with 75 companies, including 21 precision agriculture companies assigned to the field agriculture technology VC step and 16 companies assigned to the controlled environment agriculture VC step.
- 📍 Together, Ontario, BC (53 companies) and Alberta (44 companies) account for 64 per cent of all companies.
- 📍 Despite a low total number of companies, Atlantic Canada leads the country in the aquaculture VC step.
- 📍 Together, the Prairies combine for 39 per cent of the companies assigned to the field agriculture VC step.

# AGRI-FOOD TECHNOLOGY VALUE CHAIN BY PROVINCE

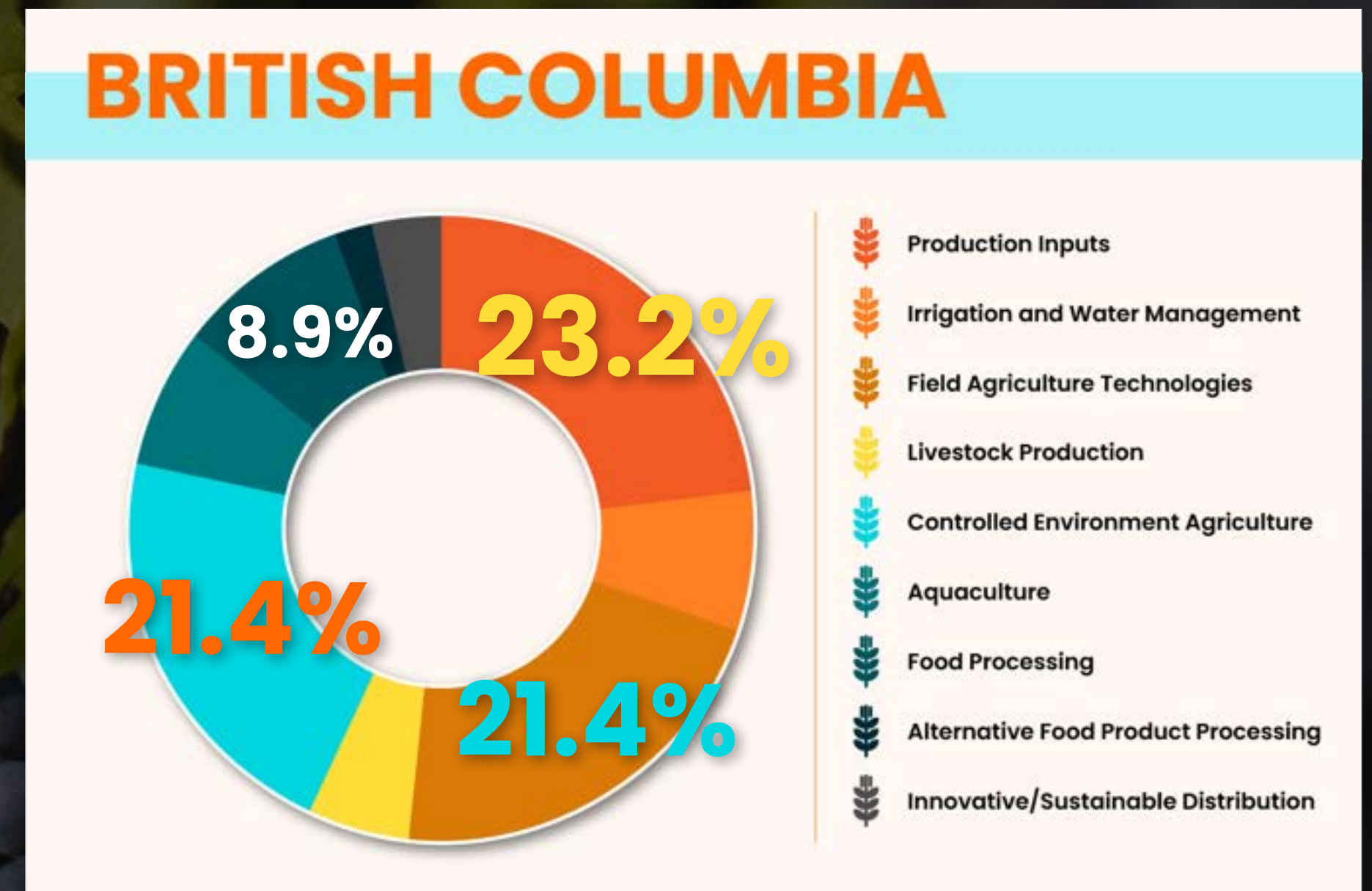


# BRITISH COLUMBIA

**BC'S VARIED CLIMATE AND TOPOGRAPHY, ACCESS TO ABUNDANT FRESHWATER RESOURCES, AND STRONG RESEARCH AND INNOVATION ECOSYSTEM HAVE MADE THE PROVINCE AN **AGRI-TECH LEADER****

BC's top three crop and livestock commodities between 2018-2022 were dairy, vegetables, and floriculture, nursery and sod.<sup>1</sup> BC's last strategic plan for the agri-food sector was released in 2015, however it had a limited focus on technology and innovation.<sup>56</sup> Since then, several provincial initiatives have filled the gap. In 2019, BC established the Food Security Task Force, which delivered its final recommendations to the government in 2020.<sup>57</sup>

Through the Sustainable CAP, \$140 million is being invested in programs including the Canada-BC Agri-Innovation Program.<sup>58,59</sup> Other notable programs include the Agritech Concierge Program, Food Processing Growth Fund, Farm Adaptation Innovator Program and the On-Farm Technology Adoption Program.<sup>60,61,62,63</sup>





# BRITISH COLUMBIA

## OBSERVATIONS

### BC IS WELL DISTRIBUTED ACROSS THE VALUE CHAIN

### PRODUCTION INPUTS AND FIELD AGRICULTURE TECHNOLOGIES ARE AN AREA OF STRENGTH FOR BC

## SUPPORTING DATA

📍 **53** companies

📍 Companies in all nine VC steps

📍 Mazarine categories: **70 per cent** (37) classified as “Address”, **19 per cent** (10) classified as “Observe/Analyze”

📍 **13** of **55** companies assigned to production inputs are based in BC

📍 **12** of **74** companies assigned to field agriculture technologies are based in BC

## DISCUSSION

In BC, 13 production input companies (the most of any province), 12 field tech (second-most) and 12 controlled ag tech companies (second-most) were identified. BC is nearly tied with Québec for the highest proportion of companies (70 percent) being classified to “Address”; the second-highest per capita value for Mazarine density, 6.9 companies per 1 million residents, was also found for BC companies classified as “Address”.

The Ministry of Agriculture and InnovateBC launched the Agritech Innovation Challenge in 2016 and provided funding to several companies in 2017 and 2019.<sup>64,65,66</sup> In 2022, the government launched the B.C. Centre for Agritech Innovation in collaboration with Simon Fraser University to support the commercialization of agri-tech in the province, provided funding to agri-tech businesses through the Agritech Ramp-Up Program, and signed a two-year action plan with the Netherlands to collaborate on the development of agri-tech.<sup>67,68,69</sup>

Knowledge generators and enablers supporting agri-food technology companies in BC include:

- 📍 Investment Agriculture Foundation of B.C.
- 📍 University of British Columbia (UBC) Food Sciences Group
- 📍 BCIT's Natural Health and Food Products Research Group
- 📍 University of the Fraser Valley (UFV) Food & Agriculture Institute
- 📍 VIU Centre for Seafood Innovation

BC ranks first and second in companies assigned to the production inputs and field agriculture VC steps, respectively. Leading precision agriculture companies, such as Terramera and Semios, are headquartered in BC. The province’s research and innovation hubs, diverse agriculture sector, and tech industry help foster these strengths.

A 2019 study investigating the role of precision agriculture in BC identified that local technology adoption can support GHG reductions, reduce water contamination and soil compaction, optimize plant health, and reduce variable costs.<sup>70</sup>

Recent examples of industry activity include:

- 📍 Terramera received \$1 million from BC’s Innovative Clean Energy Fund to develop its soil analysis technology.<sup>71</sup> Terramera also led a collaborative \$7 million Digital Supercluster project in 2022, investigating technology-enabled crop protection opportunities.<sup>72</sup>
- 📍 In partnership with Dunkley Lumber, BC Biocarbon, a leading biochar producer, is building a new biochar refinery in Saskatchewan.<sup>73</sup>
- 📍 Vancouver-based Semios raised over \$200 million since 2020, allowing for accelerated growth of its expansive crop management platform.<sup>74</sup>

# PRAIRIES

## (ALBERTA, MANITOBA, AND SASKATCHEWAN)

Innovation in the agri-food sector varies across the Prairies. Alberta released the “Agri-food Investment and Growth Strategy” in 2020 and provided a variety of supports to the agri-food sector, including Alberta Innovates’ Smart Agriculture and Food Digitalization and Automation Challenge and the targeted, sector-neutral “Investment and Growth Fund” that has invested in innovative agri-food companies. <sup>40,41</sup>

**THROUGH THE SUSTAINABLE CAP, THERE ARE SEVERAL PROVINCIAL PROGRAMS SUPPORTING TECHNOLOGY DEVELOPMENT AND COMMERCIALIZATION.**

IN ALBERTA,  
**\$508 MILLION**

IN MANITOBA,  
**\$221 MILLION**

IN SASKATCHEWAN,  
**\$485 MILLION**

Manitoba, whose top crop and livestock commodities between 2018–2022 includes hogs, released the “Protein Advantage Strategy” in 2019, which focuses on innovation in the animal and plant protein industry.<sup>42,1</sup> Saskatchewan has an independent Agri-Food Council and a dedicated Agri-Food Innovation Centre.

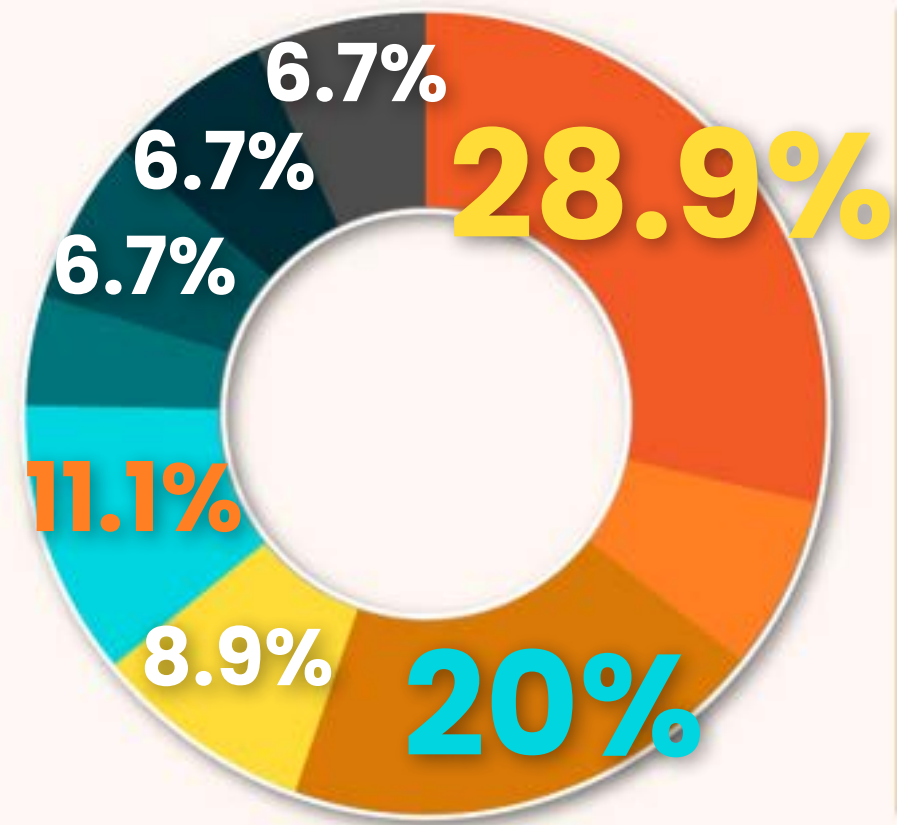
is being allocated to programs such as the Farm Technology Program. <sup>43,44</sup>

is supporting programs such as the Sustainable Agri-Processing program, Research and Innovation program and Sustainable Agriculture Manitoba; <sup>45,46,47,48</sup>

is supporting several programs, including the Agriculture Development Fund and Ag Demonstration of Practices and Technology. <sup>49,50</sup>

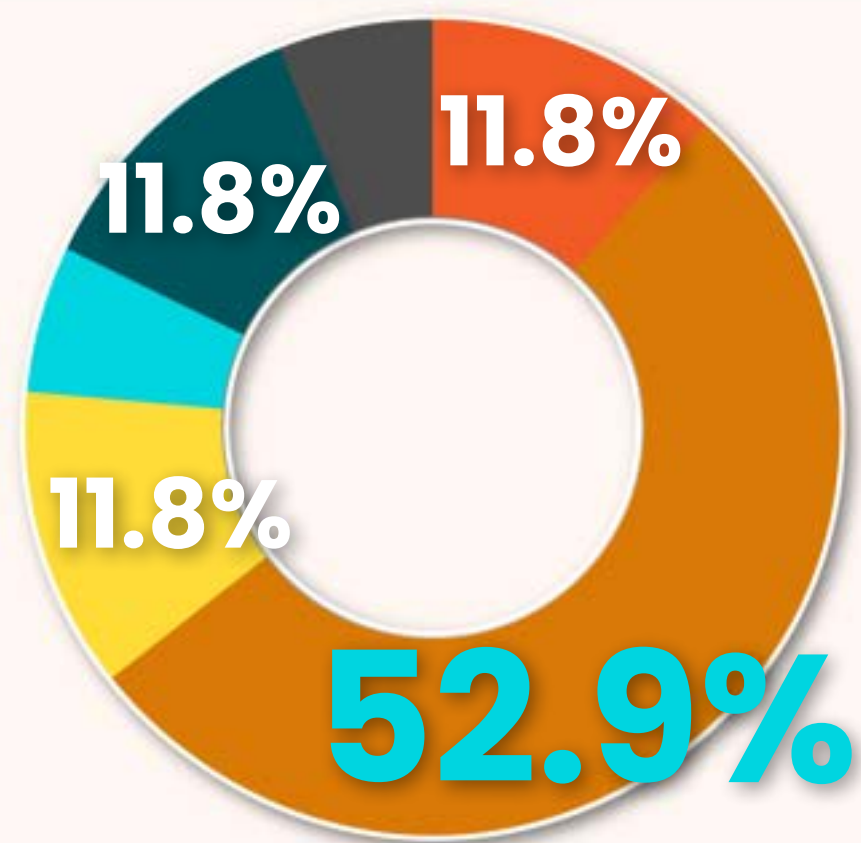
# PRAIRIES

## ALBERTA



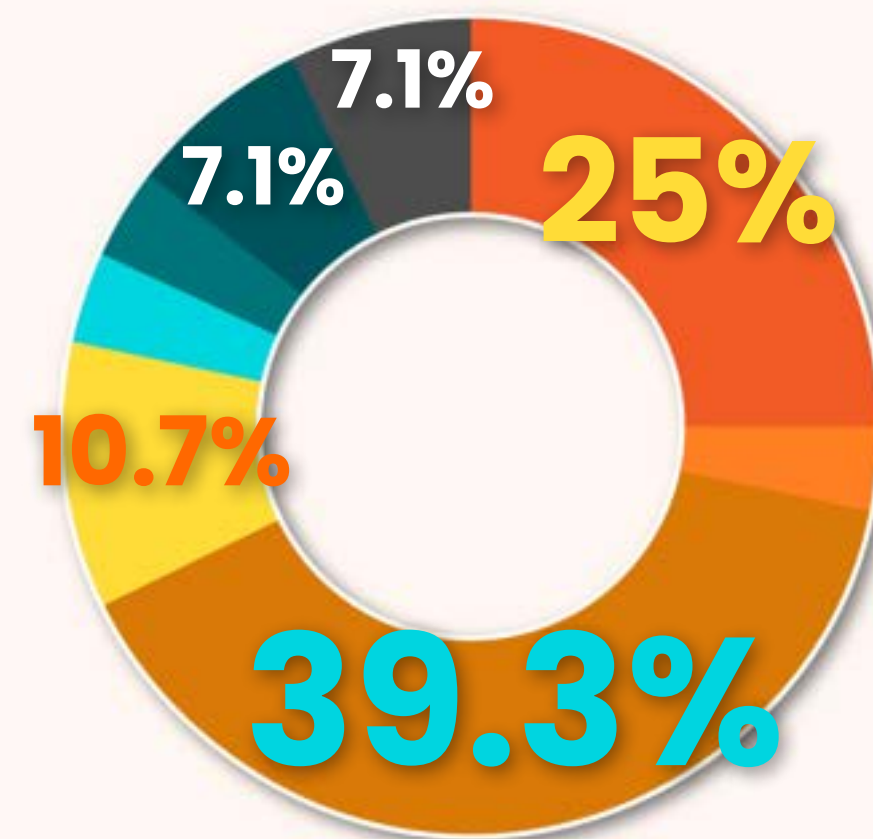
- Production Inputs
- Irrigation and Water Management
- Field Agriculture Technologies
- Livestock Production
- Controlled Environment Agriculture
- Aquaculture
- Food Processing
- Alternative Food Product Processing
- Innovative/Sustainable Distribution

## MANITOBA

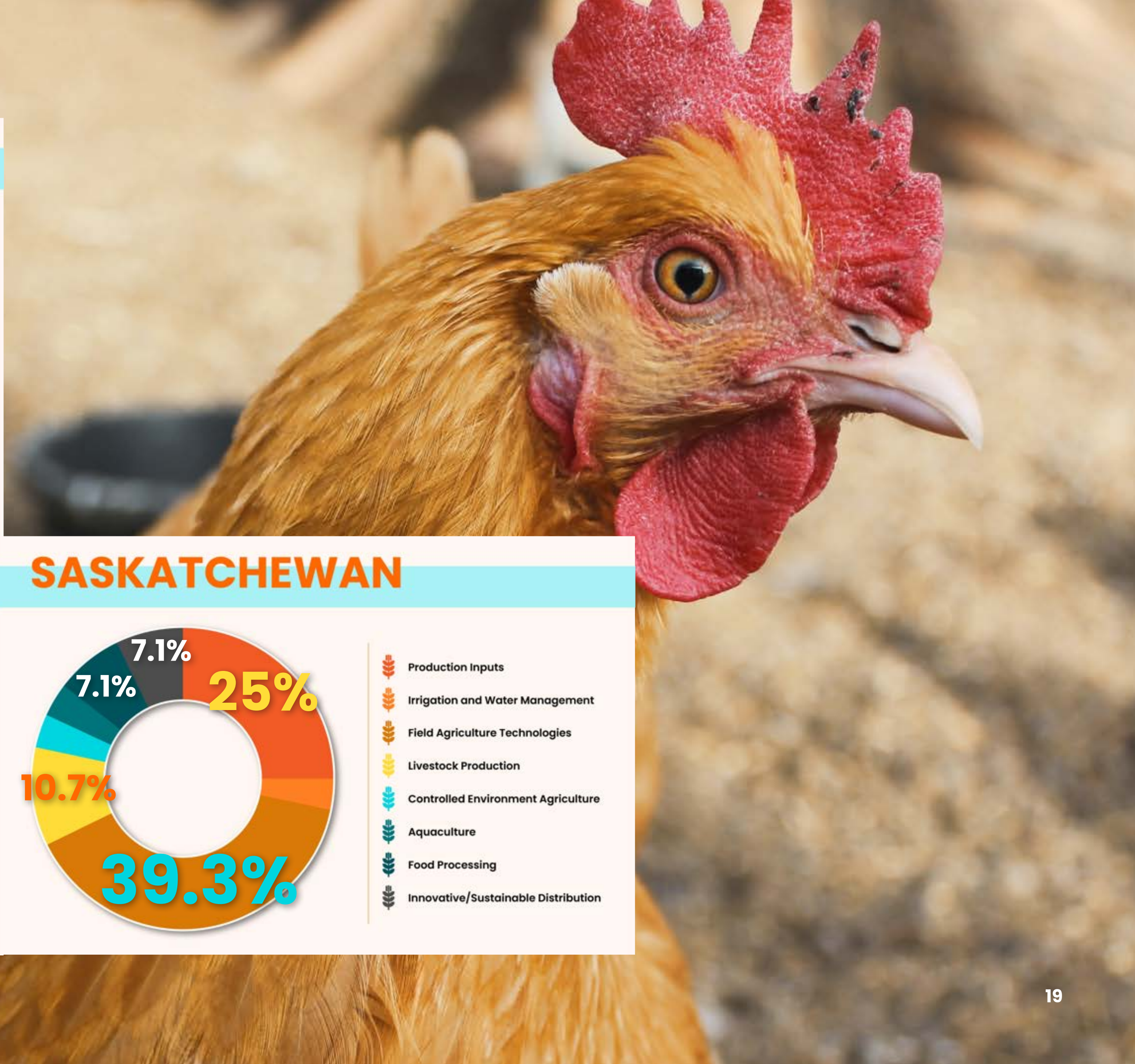


- Production Inputs
- Field Agriculture Technologies
- Livestock Production
- Controlled Environment Agriculture
- Food Processing
- Innovative/Sustainable Distribution

## SASKATCHEWAN



- Production Inputs
- Irrigation and Water Management
- Field Agriculture Technologies
- Livestock Production
- Controlled Environment Agriculture
- Aquaculture
- Food Processing
- Innovative/Sustainable Distribution



# PRAIRIES

## OBSERVATIONS

ALBERTA HAS THE HIGHEST PROPORTION OF COMPANIES IN THE PRAIRIES

## SUPPORTING DATA

📍 **44** companies

📍 Companies in **nine** of **nine** VC steps

📍 **30 per cent** and **20 per cent** of companies assigned to the production inputs and field agriculture tech VC steps

📍 Mazarine categories: **61 per cent** (27) companies classified as “Address”, **23 per cent** (10) classified as “Observe/Analyze”

## DISCUSSION

The majority of companies we identified in the Prairies are headquartered in Alberta. Alberta’s companies are well distributed outside of top VC steps (field agriculture technologies and production inputs), with companies in all nine VC steps. Alberta leads all provinces, with the highest proportion of companies assigned to the production inputs VC step (30 per cent).

Several government investments have recently supported the growth of agri-tech in the province, such as:

📍 The government followed up in 2023 with a 12 per cent investment tax credit to attract corporate investment in new and existing agri-processing operations.<sup>52</sup>

📍 \$1 million was awarded to both PIP International and Phyto Organix Foods through the Sustainable CAP for the construction of innovative pea-processing facilities in Lethbridge and Strathmore, which together will combine for almost \$400 million of investment in both communities.<sup>53</sup>

📍 Edmonton-based Wyvern Inc. secured \$4 million from SDTC in 2022, enabling an expansion of its hyperspectral imaging technology.<sup>54</sup>

Knowledge generators and enablers supporting agri-food technology companies in Alberta include:

📍 Food Processing Development Centre

📍 Result Driven Agriculture Research

📍 Agrivalue Processing Business Incubator<sup>55</sup>

📍 Platform Calgary

📍 Alberta Innovates

📍 University of Alberta (Agri-Food Discovery Place, Dairy Research and Technology Centre, Poultry Research Centre, Swine Research Technology Centre)



# PRAIRIES

## OBSERVATIONS

**SASKATCHEWAN IS WELL DISTRIBUTED ACROSS THE VALUE CHAIN**

## SUPPORTING DATA

- 📍 **26** companies
- 📍 Companies in **eight** of **nine** VC steps
- 📍 **11** field tech companies (third-most of any province), **seven** in production inputs (tied for fourth)
- 📍 Mazarine categories: **50 per cent** of companies classified as "Address"

## DISCUSSION

Almost all of the companies identified in Saskatchewan were assigned to field agriculture technologies and production inputs. Saskatchewan's values for those VC steps are the highest per capita values of any province/VC step combination. The highest per capita value for Mazarine density was also found in Saskatchewan, for companies classified as "Address".

Knowledge generators and enablers supporting agri-food technology companies in Saskatchewan include:

- 📍 Ag-West Bio
- 📍 Protein Industries Canada
- 📍 Innovation Saskatchewan
- 📍 University of Saskatchewan (Global Institute for Food Security, Crop Development Centre, Livestock and Forage Centre of Excellence, Prairie Swine Centre, Canadian Feed Research Centre)
- 📍 Agri-Food Innovation Centre



# PRAIRIES

## OBSERVATIONS

### MANITOBA HAS A STRENGTH IN FIELD AGRICULTURE TECHNOLOGIES

## SUPPORTING DATA

📍 **17** companies

📍 Companies in **six** of **nine** VC steps

📍 **53 per cent** of companies (9) develop “field agriculture technologies”

📍 Mazarine classification: **47 per cent** of companies (eight) are classified as “Observe/Analyze”

## DISCUSSION

In Manitoba, 53 per cent of the companies identified are clustered in the field agriculture VC step; this province/VC step combination was one of the top five per capita values found in the database.

Manitoba also has the highest proportion of companies classified as “Observe/Analyze”, and is one of only two provinces (the other being NB) with more companies marked as “Observe/Analyze” rather than “Address”; all eight companies marked as “Observe/Analyze” develop technologies that provide automated analysis and/or machine learning services. Nonetheless, the small sample sizes make it difficult to make any claims about these findings.

Provincial government support for agri-tech has included ongoing support for the Agriculture Innovation Hub, which funds agri-food research projects in areas of competitive advantage, as well as a \$10 million investment to develop an agri-tech hub at Assiniboine Community College.<sup>51</sup>

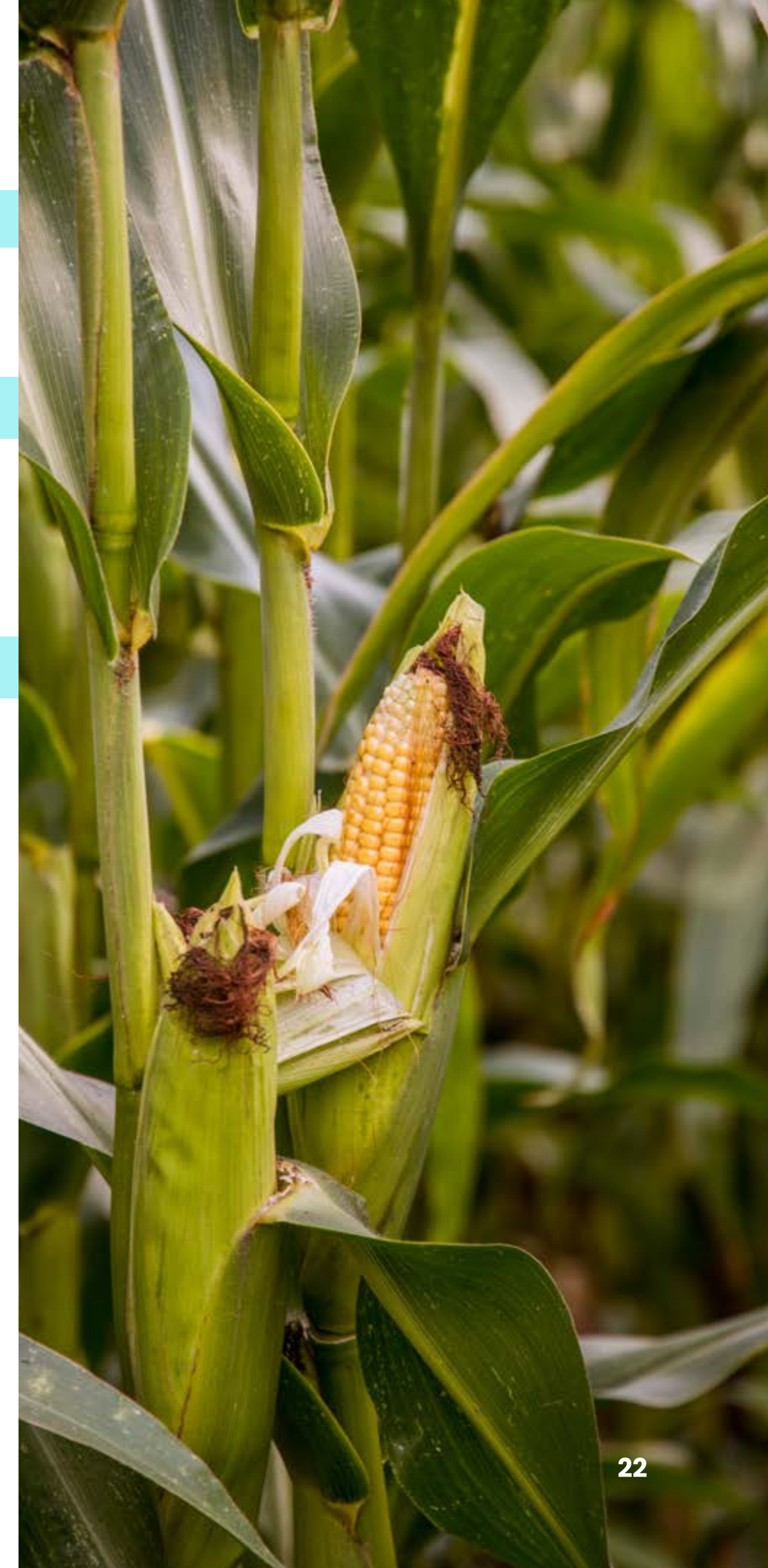
Knowledge generators and enablers supporting agri-food technology companies in Manitoba include:

📍 Manitoba Crop Diversification Centre

📍 University of Manitoba (Richardson Centre for Food Technology and Research, National Centre for Livestock and the Environment, Canadian Wheat Board Centre for Grain Storage Research)

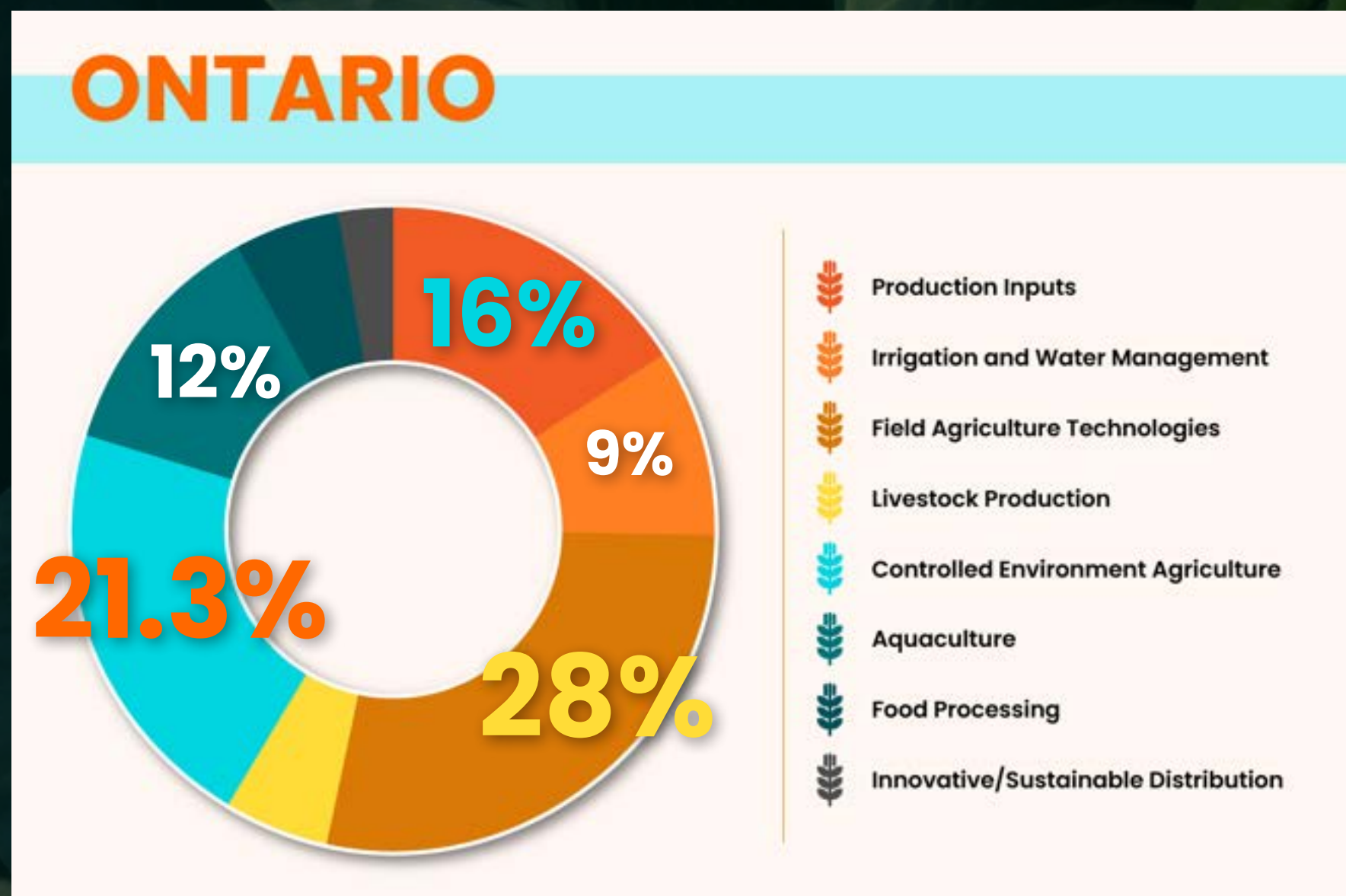
📍 North Forge Technology Exchange

📍 Prairie Innovation Centre at Assiniboine Community College



# ONTARIO

## ONTARIO IS CANADA'S LEADER OF THE AGRI-FOOD INDUSTRY



Ontario's top three crop and livestock commodities between 2018-2022 were dairy, vegetables, and soybeans.<sup>1</sup> To guide the sector, Ontario released a provincial agri-food strategy in late 2022.<sup>32</sup> The strategy focuses on supply chain stability, technology adoption, and talent development. \$25 million was invested in the Strategic Agri-Food Processing Fund to modernize and expand food processing facilities in the province.<sup>33</sup> In 2018, the province renewed an agreement with the University of Guelph, investing \$713 million to position the university as world leader in agricultural innovation.<sup>34</sup>

Through the Sustainable CAP, \$1.77 billion is being invested in Ontario's agri-food sector.<sup>35</sup> The previous CAP provided funding for Ontario's Agri-food Research Initiative, Agri-Tech Innovation Program and the Agri-Food Innovation Alliance, all of which advanced the adoption and development of advanced agri-food technologies.<sup>36,37,38</sup>

# ONTARIO

## OBSERVATIONS

**ONTARIO IS WELL DISTRIBUTED ACROSS THE VALUE CHAIN AND HAS THE LARGEST CONCENTRATION OF COMPANIES OF ALL PROVINCES**

**PRECISION AGRICULTURE TECHNOLOGIES ARE AN AREA OF STRENGTH**

## SUPPORTING DATA

- 📍 **75** companies
- 📍 Companies in **eight** of **nine** VC steps
- 📍 Mazarine categories: **55 per cent** (40) of companies classified as “Address”; **28 per cent** (21) classified as “Observe/Analyze”

- 📍 **21** of **74** companies assigned to the field agriculture technologies VC step are based in Ontario

## DISCUSSION

Ontario had the largest total number of companies by far, outnumbering the next closest province (BC) by 18. Most of Ontario’s companies were assigned to the following VC steps: field agriculture technologies (21) and controlled agriculture technologies (15); Ontario led all provinces in both those VC steps. Ontario also had the second-highest proportion of companies classified as “Observe/Analyze”.

Knowledge generators and enablers supporting agri-food technology companies in Ontario include:

- 📍 Ontario Genomics
- 📍 University of Guelph (e.g., Arrell Food Institute, Ontario Aquaculture Research Centre)
- 📍 Niagara College (e.g., Food & Beverage Innovation Centre)
- 📍 Innovation Cluster Peterborough and the Kawarthas
- 📍 Sault Ste. Marie Innovation Centre

Ontario leads all provinces in companies assigned to the field agriculture technology VC step. The 21 companies found also represent the highest number of any province/VC step combination. All 21 are precision agriculture companies. The companies identified are developing and selling technologies such as predictive analytics, farm management platforms, robotics, mapping technologies, and more.

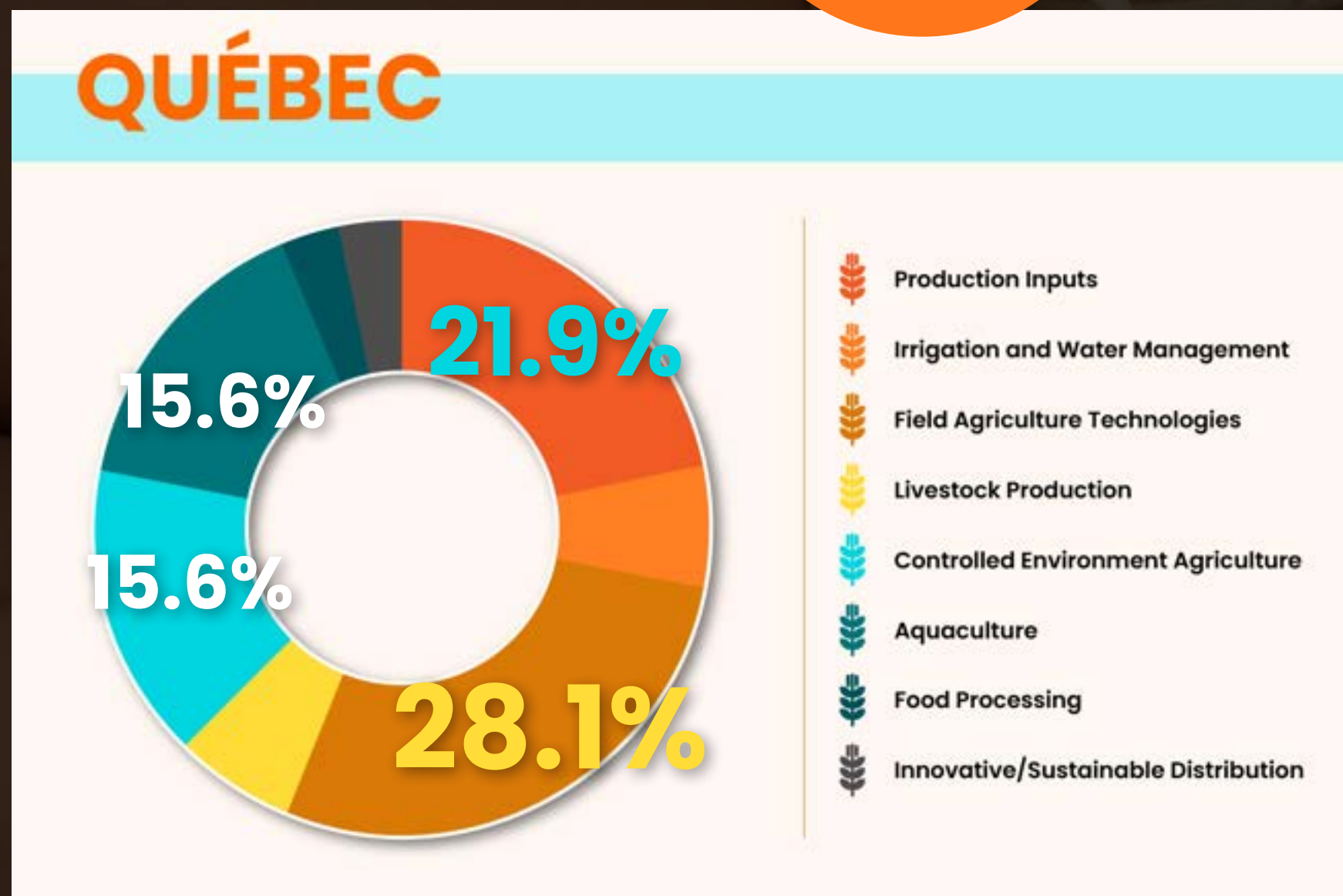
Ontario’s Agri-Food Research Initiative provided funding to Vivid Machines and Korechi Innovations in 2022 to commercialize their products. The former uses vision technology and AI to digitize crop production, and the latter develops robotics to automate a variety of farm tasks.<sup>39</sup>





# QUEBEC

IN QUÉBEC, THE AGRI-FOOD SECTOR ACCOUNTS FOR APPROXIMATELY **7.4%** OF THE GDP.<sup>28</sup>



Québec's top three crop and livestock commodities between 2018–2022 were dairy, hogs, and poultry.<sup>1</sup> The province does not have a dedicated agri-tech strategy; however, the "Sustainable Agriculture Plan", published in 2020, which prioritizes reduced pesticide use, improved soil health and biodiversity, and improved management of production inputs, includes a focus on technology adoption (e.g., precision agriculture technologies).<sup>29</sup> The "Offensive de transformation numérique", a cross-sectoral strategic initiative aiming to position Québec as a leader in machine learning and digital technology, has also supported the adoption of digital agri-tech in the province.<sup>30</sup> The Québec government also announced over \$800 million in investments for the agri-food sector this year.<sup>28</sup>

Through the Sustainable CAP, \$955 million is being invested in Québec's agri-food sector.<sup>31</sup>

# QUEBEC

## OBSERVATION

QUÉBEC IS WELL DISTRIBUTED ACROSS THE VALUE CHAIN

## SUPPORTING DATA

📍 31 companies

📍 Companies in **eight** of **nine** VC steps

📍 Mazarine classification: **71 per cent** (22) of companies are marked as “Address”

## DISCUSSION

Québec ranks fourth in our database in total companies, behind BC, AB, ON. No significant per capita values were found for any VC step, however the province had the highest proportion of its companies marked as “Address”.

Most of Québec’s companies fit in the field agriculture and production inputs VC steps. Companies identified are developing and selling products such as vertical farm systems, soil analysis technologies, innovative fertilizers and non-toxic pesticides.

Knowledge generators and enablers supporting agri-food technology companies in Québec include:

📍 Fondation

📍 Zone AgTech

📍 AG-Bio Centre

📍 Consortium for Research, Innovation and Transformation in Agri-Food

📍 Université Laval (e.g., Centre de recherche en sciences et technologies du lait)



# ATLANTIC PROVINCES

(NL, NS, NB, AND PEI)

**ATLANTIC CANADA'S AGRICULTURE  
SECTOR ACCOUNTED FOR NEARLY  
\$1.5 BILLION  
IN ECONOMIC ACTIVITY IN 2022.**

Provinces differ in their strategic planning for the agriculture sector and agri-tech specifically. While none have recent comprehensive strategies for agri-tech and sectoral innovation, all provinces have some combination of programs or strategies tackling different steps of the agri-food value chain. Examples

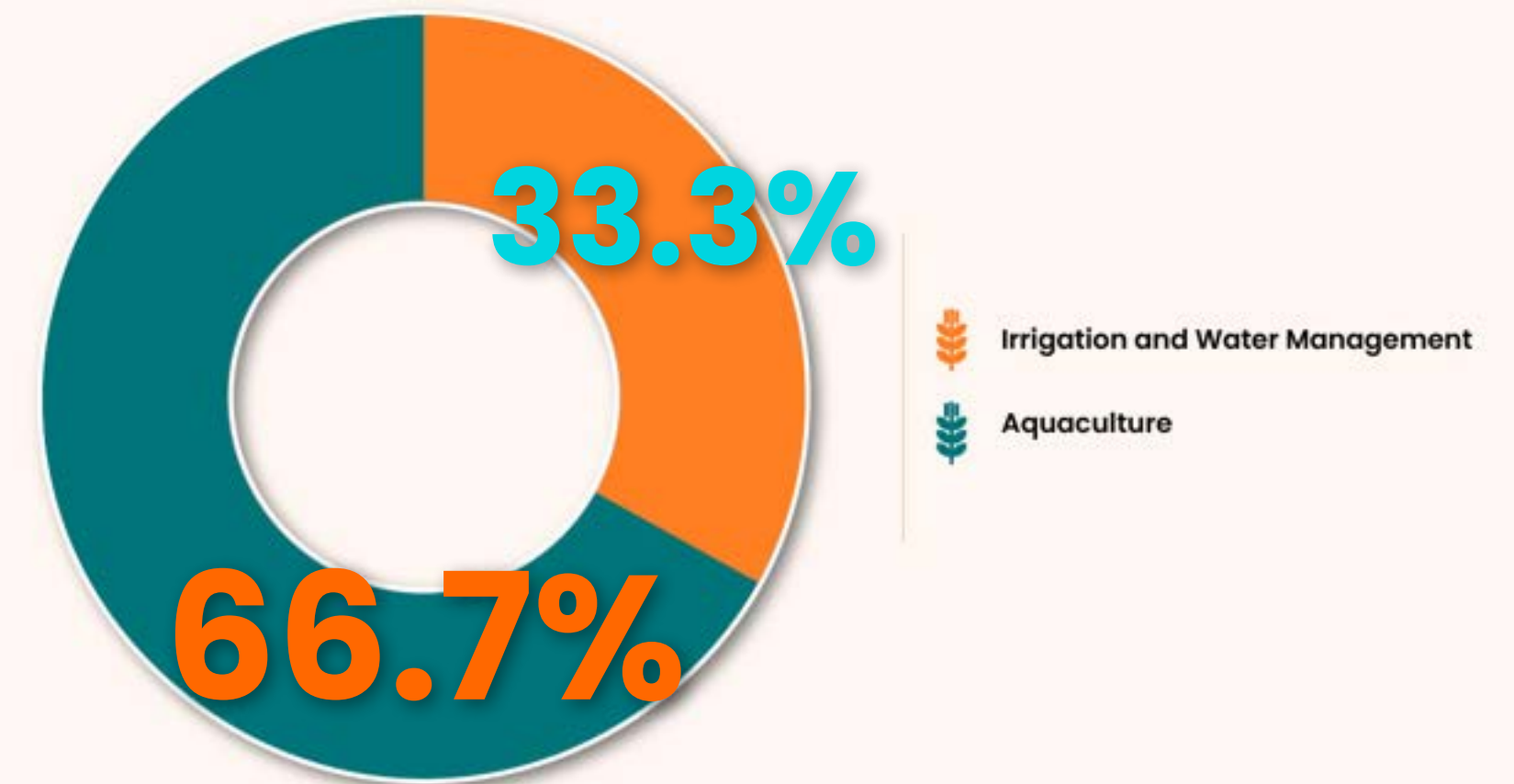
include: New Brunswick's Finfish Aquaculture Growth Strategy; Newfoundland and Labrador's Provincial Agriculture Research and Development Program; Prince Edward Island's Livestock Strategy for 2021-2025; and Nova Scotia's "Food and Beverage Strategy" and had a 2-year, \$5 million Agriculture Clean Technology Program. <sup>15,16,17,18,19</sup>

Through the Sustainable CAP, over \$100 million is being invested in Atlantic Canada, including \$46 million in Nova Scotia, \$8.5 million in New Brunswick, approximately \$43 million in Newfoundland and Labrador. <sup>20,21,22</sup> The Sustainable CAP catalyzes funds for several programs supporting agri-tech and agriculture innovation across Atlantic Canada. <sup>23,24</sup>

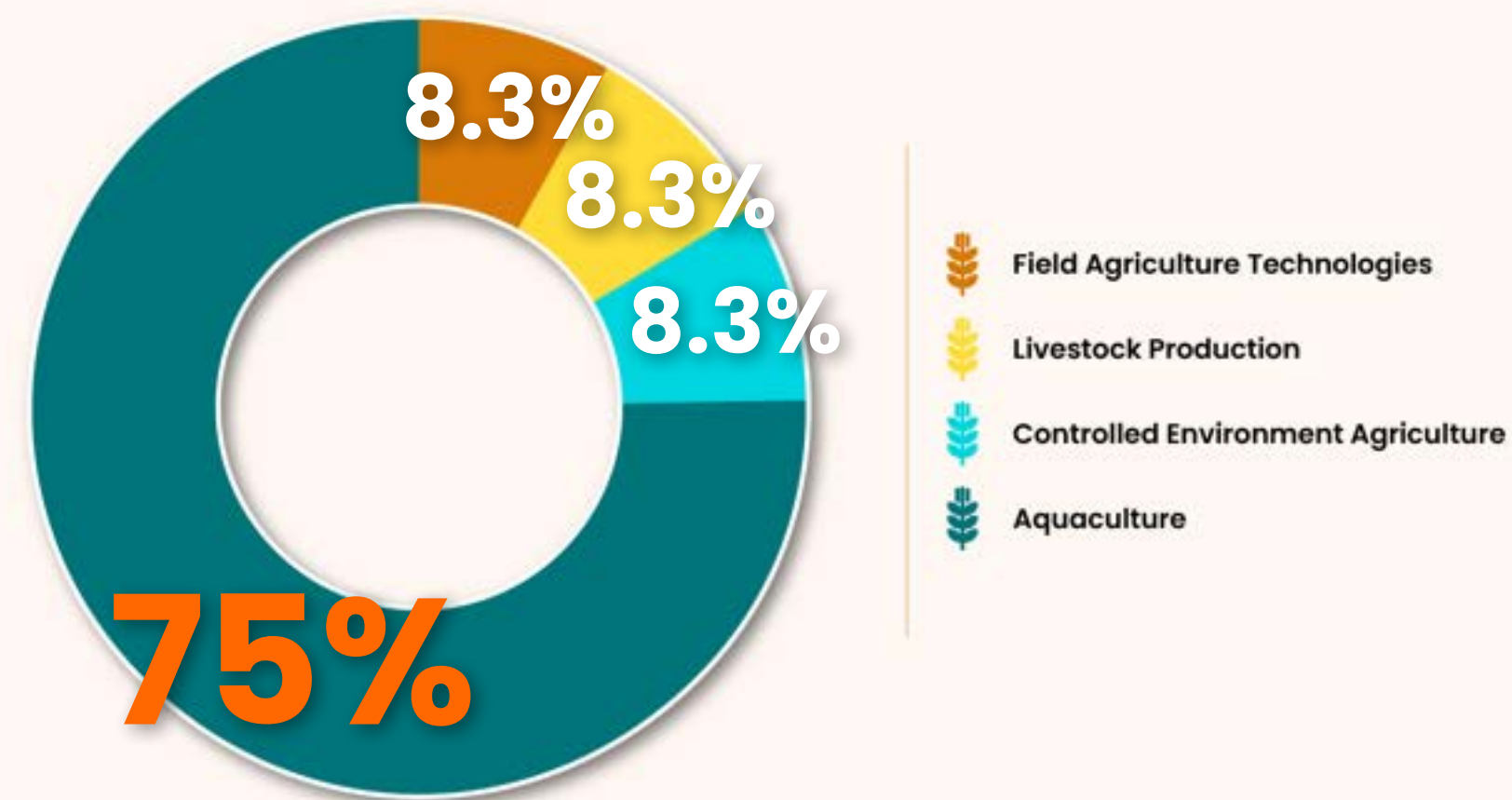
# ATLANTIC PROVINCES

(NL, NS, NB, AND PEI)

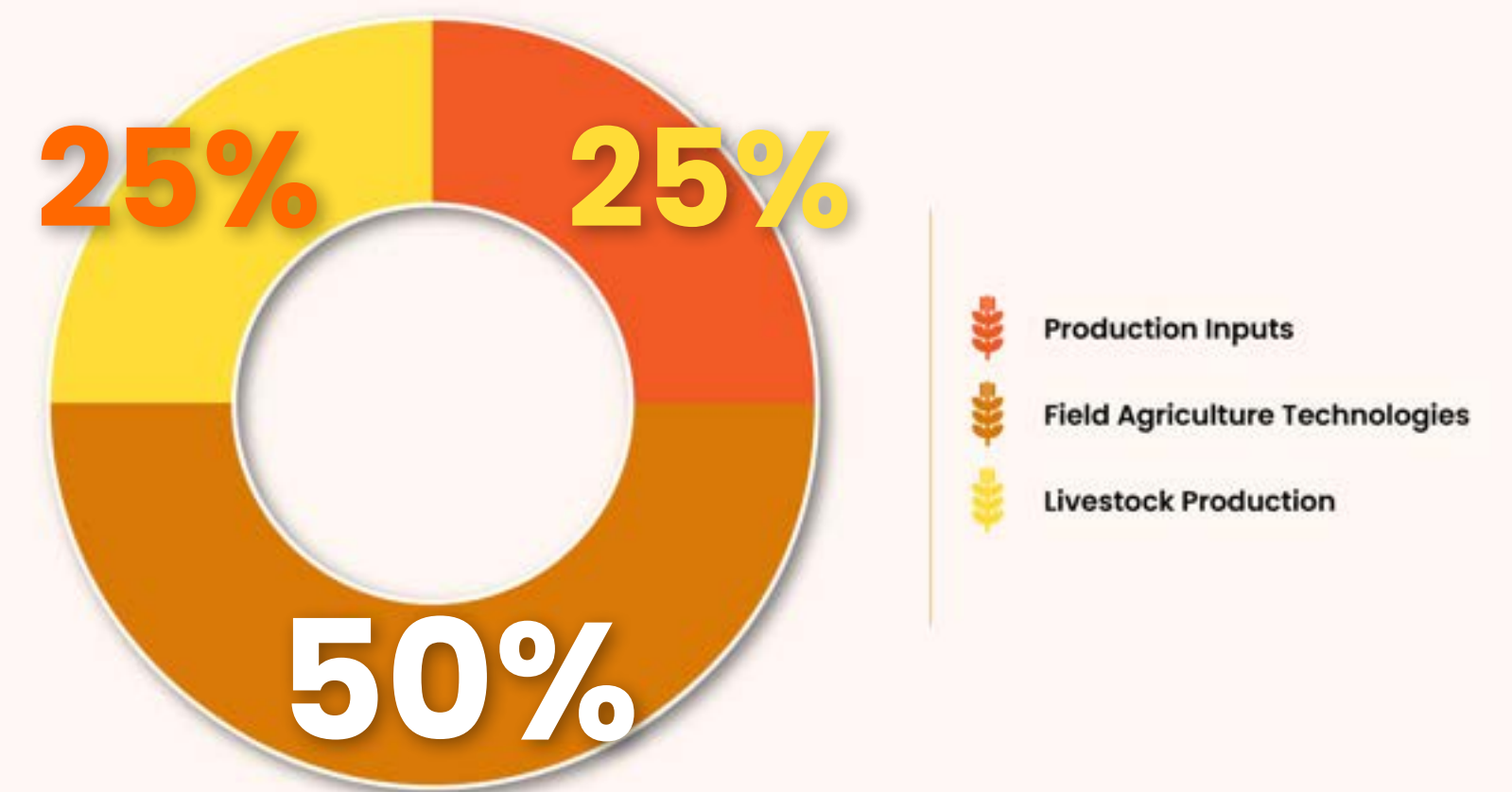
## NEWFOUNDLAND



## NOVA SCOTIA



## NEW BRUNSWICK



# ATLANTIC PROVINCES (NL, NS, NB, AND PEI)

## OBSERVATION

ATLANTIC CANADA HAS THE FEWEST NUMBER OF COMPANIES IN CANADA

## SUPPORTING DATA

📍 **12** in Nova Scotia

📍 **Two** in Prince Edward Island

📍 **Four** in New Brunswick

📍 Companies in **six** of **nine** VC steps

📍 **Three** in Newfoundland & Labrador

## DISCUSSION

In most Atlantic provinces, only a few companies were found. 12 of 20 Atlantic companies were found in Nova Scotia, indicating possible innovation clustering happening in that province.

While some regions of Canada have focused on particular crops, Atlantic Canada's agricultural diversity is viewed by experts as a strength.<sup>25</sup> The top crop and livestock commodities in Atlantic Canada between 2018-2022, by a large margin, were dairy (NS & NL), potatoes (PEI), and cannabis (NB).<sup>1</sup>

Knowledge generators and enablers supporting agri-food technology companies in Atlantic Canada include:

📍 Dalhousie University (e.g., Atlantic Poultry Research Institute, Centre for Sustainable Soil Management)

📍 Spark Nova Scotia

📍 BioFoodTech PEI

📍 Navigate

📍 IGNITE Atlantic



# ATLANTIC PROVINCES

## (NL, NS, NB, AND PEI)

### OBSERVATION

AQUACULTURE IS AN AREA OF STRENGTH IN ATLANTIC CANADA

### SUPPORTING DATA

📍 **13** companies

📍 Nova Scotia is home to **nine** of the **13** aquaculture companies.

### DISCUSSION

Atlantic aquaculture has seen a massive economic expansion in recent years: the industry's GDP rose from approximately \$92 million in 2007 to \$200 million in 2021. Atlantic Canada accounts for roughly half of Canada's aquaculture output.<sup>14</sup> The Atlantic provinces work together to grow the industry. All four provinces have signed an MOU that was extended in 2021, to cooperate on supporting and regulating the aquaculture industry.<sup>26</sup> The provinces also have a cost-shared program, the Atlantic Fisheries Fund, which supports activities related to technology research, development and installation.<sup>27</sup>

New Brunswick is at the forefront of the aquaculture industry. 40 per cent of Atlantic Canada's aquaculture workforce is based in New Brunswick and it is the only Atlantic province with a recently developed growth strategy for the industry.<sup>19</sup> Despite this reality, there are zero companies in our database based in New Brunswick and assigned to the aquaculture VC step; this represents a likely gap in our data. Nova Scotia had the most aquaculture companies of the Atlantic provinces.

There are also several industry associations supporting the growth of aquaculture businesses in the region:

- 📍 Prince Edward Island Aquaculture Alliance
- 📍 Aquaculture Association of Nova Scotia
- 📍 Atlantic Canada Fish Farmers Association
- 📍 Newfoundland Aquaculture Industry Association
- 📍 Professional Shellfish Growers Association of New Brunswick



# **AGRI-FOOD TECH IN CANADA: STRENGTHS + OPPORTUNITIES**

**THIS SECTION  
OUTLINES  
OBSERVED  
AREAS OF  
STRENGTH AND  
POTENTIAL  
OPPORTUNITIES  
FOR CANADA'S  
AGRI-FOOD  
SECTOR.**

**GLOBALLY, THE AGRI-FOOD SECTOR IS  
ESTIMATED TO ACCOUNT FOR BETWEEN**

**21% – 37% OF GHGS**

**AND**

**70% OF FRESHWATER USE.<sup>11</sup>**

Environment and Climate Change Canada estimates that **agriculture represents 10 percent of national emissions, including crop and animal production along with farm fuel use;** however, this calculation omits the GHG emissions of other parts of the agri-food value chain such as food processing and distribution.<sup>75</sup> This also does not consider the wide-ranging biodiversity impacts of the agri-food sector.<sup>76,77</sup>





# THE WIDE SCOPE OF THE AGRI-FOOD SECTOR'S ENVIRONMENTAL IMPACTS HIGHLIGHTS THE NEED FOR INNOVATION.

Canadian agri-tech companies are well placed to help the sector overcome these challenges and manage the future impacts of climate change. **Products developed by Canadian agri-tech companies offer many benefits and opportunities to reduce GHGs, reduce strain on our natural resources, and improve the sector's resiliency.**

For example, automation, sensors and data-driven decision making help improve the efficiency of the growing process, reduce labour costs, strengthen yields, and improve long term productivity and competitiveness.

# CONTROLLED ENVIRONMENT AGRICULTURE

**CONTROLLED ENVIRONMENT AGRICULTURE (CEA) refers to a variety of crop production systems enabled by technology that control the key variables affecting crop growth.** <sup>78,79</sup> Greenhouses, indoor, and vertical farms are common examples. These technologies offer several benefits to consumers and communities, such as:

- 🌱 **Extended periods of growth for diverse crops.** CEA can be independent of the local climate or weather conditions. Canada's geographic diversity makes these technologies highly valuable, particularly for remote communities that rely on imported food products, and/or communities with longer winters and shorter growing seasons.
- 🌱 **Resource and yield optimization.** CEA technologies, often paired with farm management systems and sensors, can help optimize water, nutrient and energy usage
- 🌱 **Production of high quality crops.** The consistency of controlled environments can deliver predictable output relative to open field cultivation; this includes the flavour and texture of produce delivered to customers. Increasing severity of climate risks also makes predictability a valuable asset.
- 🌱 **Localizing food supply.** Localizing supply chains helps manage macro risks, improve food security and reduce transportation-related GHGs in the agriculture sector.

**AGRICULTURE AND  
AGRI-FOOD CANADA  
SPONSORED AN INDUSTRY  
CHALLENGE IN 2021 TO  
“ENHANCE AUTOMATION  
IN CEA FARMING”, AND  
PROVIDED OVER \$1 MILLION  
TO THE WINNERS, INCLUDING  
ROBOTICS, AUTOMATION AND  
GREENHOUSE DIGITIZATION  
TECHNOLOGIES. <sup>79,80</sup>**



# CONTROLLED ENVIRONMENT AGRICULTURE

## OBSERVATIONS

CONTROLLED ENVIRONMENT AGRICULTURE IS AN AREA OF OPPORTUNITY

## SUPPORTING DATA

📍 41 of 267 companies develop and sell CEA technologies

## DISCUSSION

Most CEA companies identified in our database develop and sell variations of vertical farming systems. Some companies offer fully integrated systems that combine hardware with automation and software services, improving the technology's benefits.

There is a consumer interest in supporting local business and reducing the GHG footprint of the foods we consume; a 2020 survey found that almost 80 per cent of Canadians were open to paying more for locally grown produce.<sup>81</sup> Estimates can vary significantly, however some market research firms estimate that the value of the global CEA market could range between USD \$79 – \$265 billion by 2030.<sup>82,83</sup> Projected future climate disruptions to the agriculture industry may enhance the importance of investing in technologies that can improve food security.

However, North American CEA has faced a recent reckoning amid financial headwinds.<sup>84,85</sup> Some companies have struggled to achieve profitability and technology adopters have found implementation costs to be higher than expected.<sup>86</sup> Technology-related drawbacks have also dampened excitement in the industry. Vertical farming, which can minimize land footprints, transportation costs, fertilizer and water use, and contribute to food security, can also have significant cost and energy consumption trade-offs. Electricity requirements in particular can be extremely high for consistent lighting and HVAC systems.<sup>87</sup> A 2020 US study found the landed costs, GHGs and energy use of lettuce crops grown in Chicago and New York via CEA systems were higher than equivalent products imported from Western states.<sup>88</sup>

For the long-term viability of the sector, further investigation and testing will be needed to evaluate the sustainability of CEA technologies (e.g., Life Cycle Assessments), relative to conventional farming methods.<sup>87,89</sup> Some research has indicated that the net environmental benefits of vertical farming technologies is highly dependent on the region in which the technology is deployed.<sup>87,90</sup> Further academic research is needed to evaluate CEA's socio-economic impacts and sustainability credits.<sup>89</sup>



# PRECISION AGRICULTURE

**Precision agriculture** “involves a suite of technologies that collect and share information about the local soil, climate, plants, and livestock”, to deliver data-driven insights to customers.<sup>11</sup>

These technologies include: Global Positioning Systems (GPS) and Geographic Information Systems (GIS), remote sensing (satellites, drones, etc.), variable rate technology (VRT), automated robotics and machinery (automated planters, irrigation systems, etc.), soil and crop sensors, analytics and machine learning-enabled software.

Similar to CEA technologies, they offer benefits such as resource and yield optimization. Precision agriculture technologies can play an important role in risk management for the agriculture sector, by using data insights to support seasonal climate change adaptation and facilitate early detection of crop stresses, diseases, water risks, and pests.

The automations and software services provided by these

technologies also play an important role in employment. Difficulty securing sufficient labour for the agri-food sector has led to increased expectation that output will outpace employment in the sector as investment in automation grows (agriculture workers are currently aging at a faster pace than other sectors).<sup>14</sup> Automation and machine learning could reduce labour costs and provide predictability to owners.

Natural Resources Canada's 2022 Cleantech Industry Survey identified interesting insights for precision agriculture companies: 40 per cent have their core product at the commercial stage (TRL 9+), while 14 per cent are at an R&D stage (TRL 1-5) and 26 per cent are at the demonstration stage (TRL 6-8). The survey also found that the largest challenge faced by precision agriculture companies was raising capital.<sup>13</sup>

# PRECISION AGRICULTURE

## OBSERVATIONS

### PRECISION AGRICULTURE IS AN AREA OF OPPORTUNITY

## SUPPORTING DATA

🌱 **74** of **267** companies were assigned to the field agriculture technologies VC step

🌱 **64** of these companies develop precision agriculture technologies

## DISCUSSION

Nearly 90 per cent of companies assigned to the field agriculture VC step develop precision agriculture technologies. The findings of the 2022 NRCan cleantech survey indicate there is great diversity in the commercial readiness of precision agriculture companies and that there are opportunities for governments to step in and support firms to attract additional capital. <sup>13</sup>

Despite the value-added opportunities they offer, some precision agriculture technologies have faced challenges to adoption. VRT for example is anticipated to be a powerful tool that currently isn't "worth the time, effort and money", while producers contend with limited time and labour capacity. <sup>91</sup> According to Fertilizer Canada, only 13 per cent of Canadian growers were using VRT in 2021, suggesting a massive efficiency gap in fertilizer application. <sup>92</sup>

Some experts believe technology adoption challenges are partly because we are at the beginning of a long-term adoption curve while customers become more familiar with products. <sup>91</sup> In the case of VRT and other nutrient management technologies, other issues, such as upfront cost, information asymmetry, risk aversion and resistance to change, and a lack of robust soil testing on farmland (a critical input for analysis) are also challenges. <sup>93,94,70</sup> In 2021, Fertilizer Canada found that 30 per cent of western growers were sampling soil annually for nitrogen and 63 per cent of growers sampled for phosphorus every one to three years. <sup>92</sup>

To improve market outcomes for innovative technology firms, more widespread "training and customer support" is needed to familiarize prospective customers with offerings. <sup>93</sup> Governments can support these capacity building activities by offering growers unbiased resources to eliminate information asymmetry and demonstrate return on investment.





# RECOMMENDATIONS

**VENTURES, INVESTORS, GOVERNMENT, AND INDUSTRY CAN ALL BENEFIT FROM THIS DATA AND THE INSIGHTS IT PROVIDES ABOUT THE SECTOR AS WE TRANSITION TO A NET ZERO ECONOMY.**

**VENTURES ARE RECOMMENDED TO USE THIS DATABASE TO GLEAN VALUABLE INSIGHTS ON GAPS AND OPPORTUNITIES WITHIN THE ECOSYSTEM TO:**

- 🌱 Identify innovation opportunities, potential partnerships, and competitors segmented both by geography and position in the value chain.
- 🌱 Apply a broader understanding of where technologies fit on the value chain, take stock of what other companies fit around them to better promote their existing strengths, and make informed business decisions.

**INVESTORS AND INDUSTRY WILL ALSO FIND THIS DATA TO BE AN INVALUABLE TOOL TO USE WHEN EVALUATING INVESTMENT AND/OR ACQUISITION OPPORTUNITIES IN ORDER TO:**

- 🌱 Understand the value-add prospective ventures provide by identifying their role in the value chain.
- 🌱 Determine what competitors might exist for any given company.
- 🌱 Identify strengths, opportunities, and trends in the Canadian market to inform business decisions.







**ADDITIONALLY, **GOVERNMENTS** CAN CONSIDER THE KEY INSIGHTS DERIVED FROM THIS DATA TO IDENTIFY TARGETED AREAS FOR SUPPORT IN A MORE COORDINATED AND INTENTIONAL WAY. KEY RECOMMENDATIONS FOR GOVERNMENT INCLUDE:**

- 📍 Expand capacity building initiatives that reduce information asymmetry, reduce risk aversion, and share best practices for technology adoption.
- 📍 Explore the use of innovative demand-side financial tools to catalyze technology adoption, such as concessional loans.
- 📍 Explore the use of innovative supply-side financial tools to “crowd-in” additional private investment to Canada’s ag-tech companies.
- 📍 Expand funding for existing commercialization programs that help innovators scale-up their technologies.
- 📍 Include detailed plans for agri-tech adoption in the forthcoming national “Sustainable Agriculture Strategy”.

# CONCLUSION

THE BREADTH AND DEPTH OF THE **CANADIAN AGRI-FOOD VALUE CHAIN** DEMONSTRATES THE SECTOR'S TRACK RECORD OF **INNOVATION AND ITS BRIGHT FUTURE**. THERE ARE MANY OPPORTUNITIES FOR CANADA TO GROW AND BE **A GLOBAL LEADER IN THE NEW ERA OF AGRI-TECH PRODUCTS**.

Interested in learning more about Canada's agri-food value chain?



Please contact Alyssa Kelly, Director of Research at Foresight Canada: [akelly@foresightcac.com](mailto:akelly@foresightcac.com)

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