vineland
RESEARCH & INNOVATION CENTRE



THE INNOVATION REPORT 2026-2027





Canadian Food Security & Food Supply:

Positioning Canada & Ontario for Short & Long-Term Resilience Through Innovation



Message from the President & CEO



Ian J. Potter, PhD., FCAE

The theme of Vineland's 2026-27 Innovation Report, "Canadian Food Security and Food Supply" was established well before the Government of Canada launched its National Food Security Strategy in June 2026. The strategy's vision of "More Choice. More Control. More Canada" closely reflects Vineland's mission of "improving the economic viability, sustainability and competitiveness of horticulture in Canada," as well as the innovation actions we have taken to support the sector for the last 20 years.

Over the last decade, Canadians have faced pandemics, increased impacts of climatic and environmental events, and more recently economic uncertainty. Simultaneously, the Canadian horticultural supply system has continued to adapt to ensure consumers have access to the produce they have come to rely upon – but more can be done to support the longer-term aspirations of the National Food Security Strategy and the Grow Ontario agri-food strategy.

While Vineland often helps address immediate horticultural challenges, such as emerging pests, much of Vineland's innovation work focuses on developing consumer-preferred, grower-sustainable fruit and vegetable varieties, whether bred in Canada, or internationally and adapted for Canadian growing conditions. The focus on the needs for the sector's longer-term opportunities and uncertainties, strengthens Canada's food security and supports greater food sovereignty. These markets also create long-term export opportunities for Canadian-grown crops, including:

- **Tomato breeding**
  Building on our tomato-on-the vine (TOV) breeding program, Vineland started working on developing varieties to address tomato brown rugose fruit virus in 2019. Now in 2026, our rugose-resistant TOV's are being evaluated with growers, with additional disease-resistance traits under development.
- **Sweet potatoes**
  Vineland-bred sweet potatoes are now marketed in Europe and are available under license to Canadian growers. Early maturing varieties with high root quality, yield and consumer appeal reduce production risk and support Canadian grown sweet potatoes reaching stores for Canadian Thanksgiving.
- **Vineland's 49th Parallel Rose Collection**
  Developed with the Canadian Nursery and Landscape Association, Vineland's 49th Parallel Rose Collection will expand from four to six over the next two years. Bred for Canada's diverse growing conditions, these roses combine winter hardiness, disease resistance, and continuous bloom.
- **Tender fruit scouting**
  Vineland scouts tender fruit varieties suited to Ontario and the wider Canadian growing conditions from around the world. The scouting supports grower adoption through demonstration trials and robust intellectual property and commercialization agreements with the international breeders.

As the Government of Canada advances its National Food Security Strategy, success will depend not only on financial investment, but also on the economic and business conditions needed to deliver its intended outcomes. These practices must also include continued Canadian innovation in seed security; Canadian adapted varieties with both consumer and grower focus; agri-food processing reshoring; enhanced post harvest storage; by-product market development; intellectual property management; and the infrastructure and utilities necessary for growers and processors to remain competitive.

Vineland's systems-based approach to horticultural innovation is critical to the long-term sustainability of Canada's horticulture sector. Building on previous editions, this year's Innovation Report highlights how Vineland is innovating through new business models, new stakeholder relationships, stronger supply chains and support for Provincial and Federal governments through the Sustainable Canadian Agricultural Partnership. Together these efforts continue to advance our mission by de-risking innovation and accelerating its adoption in the horticultural sector.







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Innovation Across the Horticulture Value Chain:

Building a More Resilient Food System from Seed to Consumer



Amy Bowen, PhD.

Sustainable food production is no longer just an agricultural objective; it is a national imperative. As food insecurity rises and supply chains face increasing pressure from inflation, climate volatility and global disruption, the need for stronger domestic production and less reliance on imports is essential. Canada's horticulture sector has a critical role to play in improving access to fresh, affordable and high-quality fruits and vegetables which can be achieved through strengthening economic resilience across the value chain.

Ontario's horticulture industry already represents significant scale with a farm gate value of over $4 billion in Ontario, represented by 1,211 fruit and tree-nut farms, 1,562 field vegetable farms, and 1,672 greenhouse vegetable, nursery and floriculture operations (Statistics Canada, 2025; Ontario Ministry of Agriculture, Food and Agribusiness). With more than 5,000 food and beverage processors, Ontario has significant capacity to transform fresh horticultural production into value-added food offerings that enhance shelf life, broaden market reach and create greater value across the supply chain. As outlined in the Grow Ontario strategy, by 2032, the province aims to increase both the consumption and production of food grown and prepared in Ontario by 30%, while also growing food and beverage manufacturing GDP by 10% and agri-food exports by 8% annually. Achieving these ambitions will require more than production gains alone. It will require coordinated innovation across the full food system — from breeding and production through post harvest handling, processing, retail and consumer adoption.

That system is complex and deeply interconnected. In horticulture, value is created not at a single point, but across a supply chain that begins with seed and variety development, moves through production and post harvest management, and extends into processing, retail markets and ultimately consumer purchase. At every stage, decisions are shaped by a different kind of consumer; from growers selecting varieties and production systems, to processors evaluating functionality, to retailers assessing category performance, and finally to shoppers balancing price, quality, freshness and trust. Understanding demand at each of these points is essential to building a value chain that is both prosperous and resilient.

One of the most significant vulnerabilities in Canada's food system is its limited domestic capacity in horticultural breeding and seed production. For many high-value field and greenhouse crops, Canada remains heavily reliant on imported seed and foreign-bred varieties. This limits the sector's ability to respond quickly to local growing conditions, climate pressures, and evolving consumer preferences. It also creates broader risks for productivity, supply stability, and long-term food security. Where domestic breeding capacity has been sustained, the evidence is clear: locally adapted genetics can improve performance, strengthen resilience and better align innovation with Canadian needs.

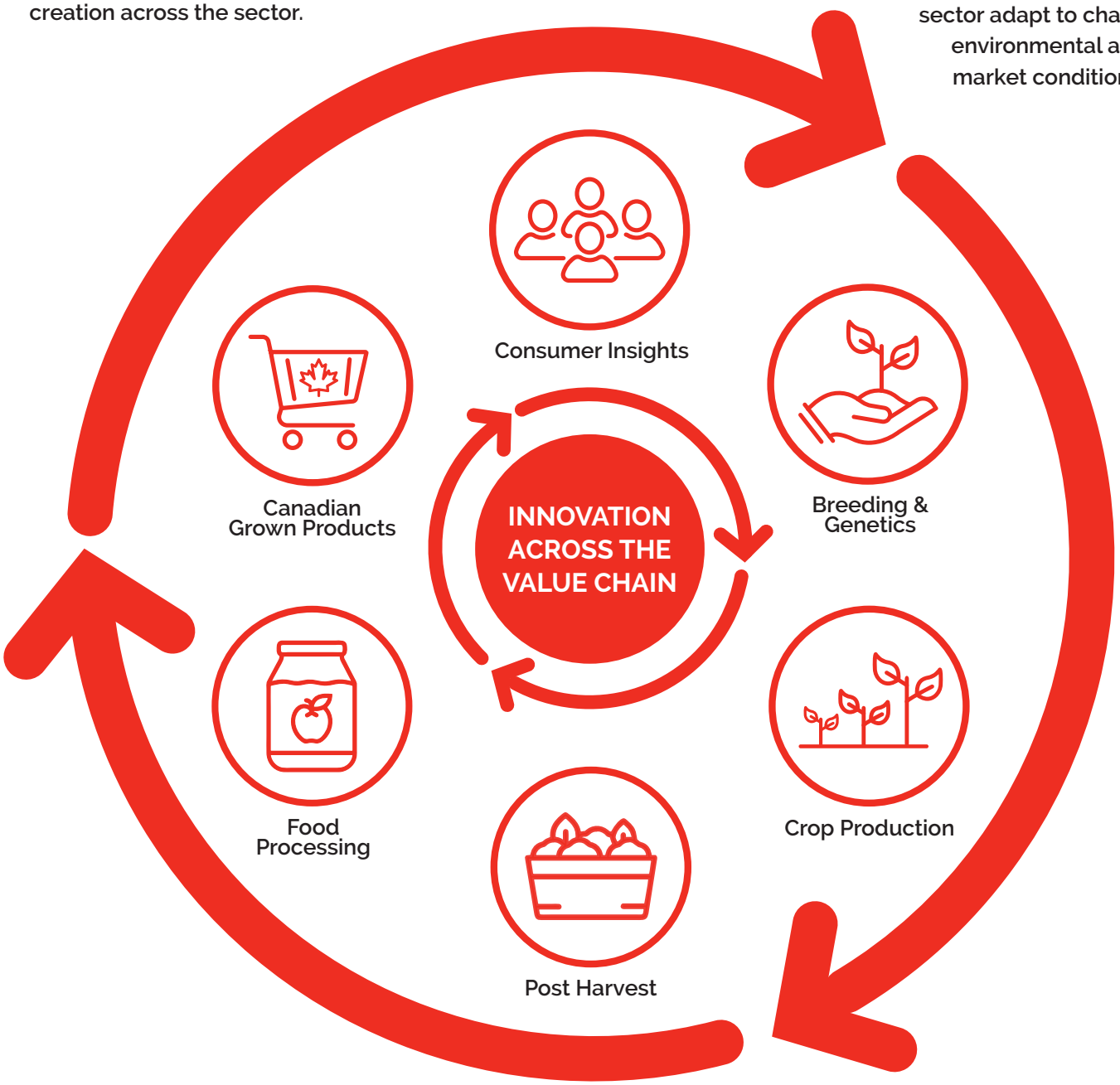
These structural challenges are unfolding against a backdrop of growing food insecurity. One in four Canadian households experienced food insecurity in 2025, and many continue to struggle to access affordable, nutritious produce. At the same time, Canada remains vulnerable to market fluctuations

Economic Growth

Investment and value creation across the sector.

Greater Resilience

Supporting the horticulture sector adapt to changing environmental and market conditions.



Stronger Food Security

More Canadian-grown food and reduced reliance on imports.

Better for Canadians

Access to fresh nutritious and trusted local food.

and supply disruptions because of its dependence on imported fresh produce and production inputs. This creates a compelling case for importance of the horticulture value chain—not only to improve supply security, but to enhance public trust to buy local and create an innovation-driven domestic food system.

This is where innovation must move beyond technical advancement alone. To succeed, new horticultural products and production systems must be grounded in market fit. Vineland's role in this process is to help identify where new products can create value in the market and where innovation can strengthen or create new supply chains. Consumer research, sensory evaluation and market intelligence provide the evidence needed to assess product quality, functionality, positioning, and commercial relevance before scaling decisions are made.

This combination of technical validation and market insight reduces risk for growers, processors and innovators while opening more credible pathways to commercialization. It also helps engage the right supply chain partners early, those best positioned to support adoption, value creation and long-term growth. In this context, consumer and sensory insights are not simply tools for product evaluation; they are strategic inputs that shape viable supply chains, inform partnership decisions, and accelerate the uptake of innovative food solutions.

Innovation in horticulture is not a linear process from seed to shelf. It is a connected ecosystem in which genetics, production, post harvest performance, market requirements, and consumer expectations must all align. A stronger Canadian horticulture sector will depend on the ability to integrate these perspectives and act on them with a focus on local and sustainable production. That is the opportunity ahead: to build a domestic food system that is more adaptive, more competitive and better equipped to deliver value from seed to consumer.

1 in 4 CANADIAN HOUSEHOLDS

experienced food insecurity in 2025. Building a stronger domestic horticulture sector is essential to improving access to fresh, affordable and nutritious food while reducing dependence on imported products.



Alexandra Grygorczyk, PhD.

Case study #1: Greenhouse Grade-outs

Canada's greenhouse vegetable growers routinely lose marketable yield because fresh-market cosmetic standards require edible vegetables that are too small, too large, misshapen, or too close to peak ripeness to be discarded. These grade-outs can represent 5% or more of production, creating both an economic loss and an untapped opportunity.

Vineland investigated how these vegetables could be redirected into higher-value uses that improve profitability across the value chain. The project combined on-farm discard assessments, sensory and processing trials, and interviews with growers, processors, distributors, and international upcycling companies. This whole-chain approach assessed both the processing potential of imperfect vegetables and the market and logistical factors affecting adoption.

A key enabler was Vineland's Food Technology Lab, which provides industry with specialized capabilities for product development, ingredient innovation, and applied food-processing research. Using this facility, researchers transformed greenhouse grade-outs into powders, cold-pressed juices, and purees. Trained sensory panelists compared products made from fresh-market (No. 1) greenhouse vegetables, greenhouse grade-outs, and field-grown counterparts.

Results challenged long-held assumptions. Oversized cucumbers, often discarded for being watery when eaten fresh, produced sweet, aromatic juices with the highest yields. Small side-shoot peppers showed no increase in bitterness and performed comparably to No. 1 peppers after processing. "Too red" tomatoes, typically rejected as over-ripe, scored higher in

"Innovation in horticulture is not a linear process from seed to shelf. It is a connected ecosystem in which genetics, production, post harvest performance, market requirements and consumer expectations must all align."

sweetness and tomato flavour than field tomatoes in juice and puree applications. These findings demonstrate strong functional and sensory performance for many greenhouse grade-outs.

Market analysis identified specialty manufacturing, including premium juices, sauces, and salsas, as the strongest commercial fit. The research also highlighted the importance of efficient distribution models and partnerships with established brands to accelerate commercialization and market adoption. Vineland's work provides a practical roadmap to improve yield recovery, create new revenue streams, and translate research into industry-ready solutions that strengthen competitiveness across the horticulture value chain.



Dan Bath, PhD.

Case study #2: Northern Food Security: Supporting Local Fresh Food Production in Remote Communities

Remote Canadian northern communities face significant challenges accessing fresh produce. Long transportation distances, high freight costs, limited cold storage, weather disruptions, and short growing seasons can affect availability, quality, and price. Strengthening local food production offers an opportunity to improve food security, increase community resilience, and reduce reliance on long-distance supply chains.

Vineland works with remote Indigenous communities to evaluate practical options for growing more fresh food locally. Rather than prescribing a single solution, the goal is to help communities identify production systems that align with their land base, infrastructure, labour capacity, training needs, and long-term food goals.

This work includes planning for a range of production systems, each offering distinct benefits. Outdoor field production can support seasonal crops and storage of vegetables. Hoop houses can extend the growing season and improve consistency. Greenhouses may provide greater environmental control where infrastructure and operating resources exist, while trial orchards help assess longer-term opportunities for perennial fruit production in northern climates.

A key finding is that communities often need support during the earliest planning stages. While interest in local food production may be strong, identifying suitable crops, infrastructure, equipment, sites, and training requirements can be difficult. Detailed feasibility studies and engineering plans are often costly before a project concept is clearly defined.

To address this gap, Vineland is developing a streamlined, lower-cost planning approach that helps communities quickly evaluate options, identify technical constraints, and define practical next steps. By combining applied research, technical expertise, and production planning, Vineland provides an accessible pathway for communities to make informed investment decisions and build resilient, community-led food systems that improve access to fresh produce in remote regions of Canada.



Breeding & Genetics:
Seed Sourcing & Securing Supply

As Canada's leading horticultural innovation organization, Vineland has a well-earned reputation as a careful steward of our own and our clients' intellectual property (IP). IP protection and management are essential to driving follow-on investment, encouraging deliberate uptake, and ensuring innovations deliver broad benefit. Those benefits can include economic growth, new jobs, stronger Canadian companies, and returns that help power further innovation. But those outcomes depend on innovations reaching the market and being used in practice. That is why intellectual property matters not only as a legal or commercial asset, but also as a strategic tool for addressing gaps and vulnerabilities in Canada's horticultural supply chains. In that context, the cultivation and management of IP can play an important role in strengthening Canadian food security and sovereignty.



Travis Banks, PhD.



Michael Pautler, PhD.

According to Agriculture and Agri-Food Canada's (AAFC) Statistical Overview of the Canadian Greenhouse Vegetable and Mushroom Industry, 2024, the Canadian greenhouse vegetable exports reached approximately $1.95 billion, a 17% increase over the previous year and the highest export value of any fresh produce category in Canada. Greenhouse vegetables accounted for 47% of the value of all fresh produce exports, led by cucumbers (38%), tomatoes (33%), and peppers (29%). Nearly all of these exports, 99% by value, are destined for the United States, generating a greenhouse vegetable trade surplus of approximately $1.2 billion.

"Intellectual property is more than a commercial asset — it is a tool for supply chain resilience, economic growth and long-term food sovereignty."

Canada is also a major player in field vegetable markets. In 2025, field vegetable exports exceeded $1.11 billion, increasing 5.2% year over year and positioning Canada as the sixth-largest fresh vegetable exporter globally, accounting for 4.2% of world exports. The United States remains Canada's dominant customer, receiving 97% of Canadian field vegetable exports. Together, these figures demonstrate the strength, scale, and international competitiveness of Canada's vegetable sector.

Canada remains heavily dependent on foreign suppliers for both year-round vegetable availability and the seed genetics that underpin production. The country's short growing season and geographic realities require significant imports, particularly from Mexico and the United States. This contrast highlights an important opportunity: while Canada excels at producing and exporting vegetables, much of the intellectual property, genetics, and seed supply that make that production possible originate elsewhere. Greenhouse tomato, pepper and cucumber seeds are sourced primarily from Dutch and European breeding programs, while major field crops such as onions and carrot seeds rely on genetics developed in the Netherlands, Israel, Japan, and the United States. As a result, much of the intellectual property and seed supply that underpin Canada's export success remains under foreign control.

In 2024 alone, Canada imported more than $278 million worth of vegetable seed (Statistics Canada). The situation is further compounded by market concentration, with a small group of multinational companies controlling more than 80% of greenhouse tomato seed sales. In the past 15 years, only three greenhouse vegetable varieties have been developed by Canadian breeding programs, all originating from Vineland. While Canada has become a world-leading producer and exporter of vegetables, it remains largely a consumer rather than a creator of the genetics that make that production possible.

For a country with significant agricultural capacity, research infrastructure, and growing domestic food policy ambitions, that gap represents one of the more straightforward value creation opportunities in the agri-food sector. Canada's vegetable seed sector has identified opportunities for further international market growth, with approximately $2.2 million in unrealized export potential for vegetable seeds for sowing across individual global markets (Source: International Trade Centre (ITC), Export Potential Map, accessed August 19, 2026). According to AAFC, Canada alone grows approximately $4.5 billion worth of the crops those seeds produce. In the absence of Canadian control of the underlying IP, the value, the benefits, and the



Canada's Vegetable Seed Trade Imbalance

$278M imports *vs* **$5.2M** exports



Vineland Precommercial Collaboration Greenhouse

supply chain leverage that comes with owning elite genetics, all flow almost entirely outside the country. Closing even a portion of that gap would deliver direct economic returns to Canadian growers, supply chains, and the public institutions that support them.

Prioritizing domestic vegetable seed production would strengthen supply resilience, generate exportable surplus, and improve Canada's trade position. According to the International Trade Centre (ITC), Canada's unrealized export potential for vegetable seeds (HS 120991) in individual markets is estimated at $3.10M in 2030. Building domestic production would reduce Canada's exposure to international supply-chain disruptions and tariff-related risks, while creating opportunities to increase export earnings through surplus Canadian-produced vegetable seed and strengthen the trade balance. Collectively, these efforts would strengthen the reliability, sustainability, and competitiveness of Canada's food system while reducing food supply and security-related risks.

Domestic variety development and IP ownership matter because of what the underlying genetics enable, not simply to hold patents and plant breeders' rights for their own sake. When a Canadian breeding program owns elite material adapted to Canadian conditions, growers gain access to reliable, locally optimized seed without depending on international suppliers whose priorities and production decisions are set elsewhere. Supply chains can plan around consistent performance. And when production challenges emerge, whether from climate variability, a new agronomic pressure, or a disruption in global seed supply, the capacity to respond sits inside Canada rather than outside it.

Vineland's breeding programs are building domestic capacity in crops where the opportunity is clear and the potential impact is significant. This work is guided by three priorities: consumer-driven sensory traits, grower-driven disease resistance, and climate adaptation for optimal performance and profitability.

> *"Canada is a significant consumer of vegetable genetics and yet we are not yet a meaningful creator of them."*

Consumer preferences ultimately determine market success, making flavour, texture, appearance, and overall eating quality essential targets for variety development. At the same time, growers need varieties that can withstand increasing disease pressures while maintaining productivity and reducing crop losses. Vineland is therefore integrating resistance to economically important diseases into Canadian-adapted germplasm, helping growers reduce production risk and reliance on crop protection inputs. The third priority is climate adaptation. As growing conditions become more variable, varieties selected under Canadian field and greenhouse environments can provide a meaningful advantage in yield stability, quality, and resilience. Together, these priorities are helping create horticultural varieties that satisfy consumer expectations, improve grower profitability, and perform under the unique production conditions found in Canada. For example, Vineland-bred greenhouse tomato efforts continue to incorporate resistance to diseases such as tomato brown rugose fruit virus, powdery mildew, and fusarium wilt without compromising flavour or market quality.

Increasing domestic food production and consumption will require more than expanded production capacity; it will require better-performing genetics developed for Canadian growing environments. Vineland is building the IP portfolio, the breeding pipelines, and the supply chain relationships to help make that possible. The opportunity is real, the foundation is in place, and the work is producing results.

Tool #1 - Vineland's Intellectual Property: Genetics and Platform Development

Vineland has developed a portfolio of plant varieties specifically for Canadian growing conditions, addressing gaps not met by imported genetics. This work demonstrates that breeding for Canada creates more than locally adapted crops; it generates valuable intellectual property (IP) that can be strategically managed to maximize economic impact. Whether propagated by seed, such as tomato, or vegetatively, such as apple and sweet potato, Canadian-developed varieties provide advantages that imported genetics cannot consistently deliver. By maintaining ownership or stewardship of this IP, Vineland can influence market adoption, prioritize Canadian benefit, and retain value within the country.

In greenhouse tomatoes, European-bred varieties dominate production but were developed for climates with lower solar radiation and cooler evenings than those found in Canada's greenhouse region. Vineland's breeding program is developing varieties that combine exceptional flavour, strong regional adaptation, high yields, and disease resistance. Building on significant gains in flavour and performance, the program is now focused on surpassing the productivity of leading imported varieties while reducing production risk for growers.

In apples, Vineland is developing varieties tailored to Canadian growing conditions and consumer preferences, with early results matching or exceeding standard market varieties. Its first commercial apple variety will be available for planting in 2028. To maximize Canadian returns while expanding market reach, Vineland is partnering with the Associated International Group of Nurseries (AIGN) to bring these genetics to international markets.

> *"Domestic control does not mean limiting ambition; it means building from a position of strength."*

Sweet potatoes further demonstrate the value of climate adaptation. Vineland-bred varieties produce approximately 20% more No. 1 grade product and can be harvested up to three weeks earlier than U.S.-bred varieties, reducing frost risk and enabling growers to capture peak October demand. Their short-season adaptation also supports expansion into Western Canada. These varieties have already been licensed in Europe, demonstrating global demand for Canadian-developed genetics.

Supporting all three programs is a growing portfolio of proprietary genomics, bioinformatics, genotyping, and trait-development platforms. These capabilities strengthen future breeding efforts, support precision gene-editing advances, and generate additional value through services provided to plant breeders worldwide.

Tool #2 - What's Next: Cultivating IP for Resilience, Growth, and Security

By developing, securing, and strategically managing plant variety IP in Canada, Vineland can ensure that the primary benefits of horticultural innovation accrue to Canadian growers, companies, suppliers, and consumers. Domestic control does not mean limiting ambition; it means building from a position of strength. Once Canadian priorities are protected through thoughtful ownership, licensing, and commercialization structures, Vineland can extend these innovations into international markets in ways that generate revenue, attract follow-on investment, and reinforce Canada's role as a source of globally relevant horticultural genetics. In doing so, Vineland can turn IP into more than a commercial asset: it becomes a tool for supply chain resilience, economic growth, and long-term food sovereignty.

FROM GENETIC INNOVATION TO FOOD SECURITY

Nearly all vegetable varieties grown commercially in Canada originate from breeding programs outside the country. Developing and owning Canadian-adapted genetics improves supply security, strengthens food sovereignty and keeps more economic value within Canada.

Crop Production:
Securing Research & Innovation Initiatives



Rhoda deJonge, PhD.

Canada's berry industry is facing growing pressure from climate variability, rising production costs, and labour shortages. Weather-related events are already affecting production across the country. In Atlantic Canada, drought conditions, pollinator shortages, and pest pressure have reduced blueberry yields, while extreme winter weather events have caused significant losses in strawberry and raspberry production. Demand for pollination services in some blueberry-growing regions now exceeds the available supply of pollinators, creating an additional production risk. At the same time, Canada remains heavily dependent on imported fruit to satisfy year-round consumer demand. According to Agriculture and Agri-Food Canada (AAFC), the national fruit trade deficit reached a record $7.2 billion in 2024.[1] Despite producing more than 400,000 tonnes of berries annually, Canada imported approximately $735 million worth of strawberries, $414 million worth of raspberries, and $586 million worth of blueberries in 2024 alone. These challenges highlight the need for more resilient production systems that can extend harvest windows, improve production consistency, and increase domestic supply. Protected production systems show considerable promise, but growers still lack regionally relevant data on crop performance, economics, and best management practices under Ontario conditions. Questions remain around crop performance, system economics and best management practices under Ontario conditions. Vineland aims to address this gap by providing growers with the evidence, tools and decision-support resources needed to increase domestic berry production and strengthen Canada's food system resilience.

Funded through AAFC's AgriScience Program, Vineland Research and Innovation Centre (Vineland) is currently in year two of a four-year project to boost Canada's berry production through season extension. The project brings together production system trials, substrate innovation and industry collaboration across multiple sites to evaluate the opportunities and risks of covered production systems and generate credible, practical guidance for growers.

Production Systems

Vineland is evaluating rain shelters, retractable roof systems, and greenhouse environments with and without photovoltaic (solar) technology. These systems were selected to reflect a practical range of adoption pathways, from lower-cost season extension tools to higher-tech controlled environments aimed at off-season production. Rather than focusing on individual technologies in isolation, the research aims to quantify the trade-offs between productivity, resource efficiency, economic viability, and environmental performance. Across multiple fruiting cycles, researchers are assessing raspberry and blueberry production for yield, fruit quality, production consistency, and the impact of different growing environments on irrigation requirements, energy use, and overall system efficiency.



1 Agriculture and Agri-Food Canada (AAFC), Statistical Overview of the Canadian Fruit Industry, 2024 (Government of Canada, 2025). Source data: Statistics Canada, CATSNET, March 2025.







To better understand the long-term sustainability of protected berry production, the project also includes a comprehensive Life Cycle Assessment (LCA) of each production system. This analysis evaluates greenhouse gas emissions, energy consumption, water use, and other resource inputs across a range of production scenarios, from conventional field-grown berries to highly controlled environments. By combining agronomic, economic, and environmental data, Vineland is generating the evidence needed to identify production systems that can improve resilience, extend local supply, and support more sustainable berry production under Ontario growing conditions.

Substrate Innovation

Vineland is advancing substrate innovation to support more productive, efficient and sustainable berry production systems while reducing reliance on peat and imported growing media such as coco coir. Working with industry partners, researchers are evaluating alternative substrates, including wood fibre-based blends and recycled stone wool, to determine their suitability for protected berry production. The work examines plant growth, yield, root-zone performance, water-holding capacity and irrigation management requirements to identify solutions that are both commercially viable and environmentally responsible.

Early raspberry trials conducted under retractable roof systems demonstrated that wood fibre-based substrates performed comparably to conventional coco coir, indicating that locally sourced alternatives may offer a sustainable option without compromising crop performance. Additional research is underway to evaluate the potential of reused stone wool substrates, further expanding opportunities to recover and repurpose materials already used within the horticulture sector. By identifying high-performing alternatives to imported growing media, Vineland is helping strengthen supply chain resilience, reduce environmental impacts, and create new opportunities for Canadian-made growing inputs that support the future of protected berry production.

1 Setting up the raspberry trials in Vineland's Cravo, retractable roof, growing environment.

2 Measuring leaf chlorophyll content.

3 In-field raspberry trials at Fenwick Berry farm.

Collaboration

Collaboration with industry partners is central to ensuring the project's findings are practical, commercially relevant and useful to growers. Vineland is working with partners across production, pest management, grower engagement and substrate innovation, including Freeman Herbs, Fenwick Berry Farm, the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA), Berry Growers of Ontario, Grodan and Gro-Bark.

Freeman Herbs, based in Lincoln, Ontario, is one of Canada's leading growers and distributors of fresh herbs and specialty products. Freeman is supporting the project by hosting blueberry trials in greenhouse systems, both with and without integrated energy-producing solar film. This collaboration is helping assess the potential for off-season blueberry production while exploring approaches that may reduce energy dependence. These comparisons are important as growers look for ways to manage rising input costs while maintaining a consistent supply of high-quality fruit.

Fenwick Berry Farm, based in Fenwick, Ontario, is a first-generation family farm producing multiple berry crops for U-pick, wholesale and retail markets, as well as strawberry plugs and raspberry and blackberry long-canes for other producers. Vineland's collaboration with Fenwick Berry Farm provides insight into commercial-scale raspberry production under rain shelter systems, including sustainable crop management and integrated pest management practices. This partnership helps ensure production observations reflect the realities of working farms, not only controlled research environments.

OMAFA is contributing integrated pest management expertise to support the development of standardized scouting protocols across production systems. This guidance helps ensure pest and disease observations are collected consistently and can be compared across sites. The resulting data will support both research interpretation and practical grower decision-making.

Berry Growers of Ontario is helping connect the project to grower priorities and adoption considerations. Integrating grower perspectives is essential to ensuring Vineland's recommendations are clear, scalable and practical to implement. Through this collaboration, Vineland is gathering feedback on emerging findings and strengthening the link between research outcomes and on-farm decision-making.

Grodan and Gro-Bark are supporting the project's substrate innovation stream. Grodan Canada, based in Milton, Ontario, supplies soilless root-zone management solutions for controlled environment agriculture. Gro-Bark, part of Walker Industries and based in Thorold, Ontario, produces substrate blends, soils and mulches.

For Ontario, and Canada as a whole, the potential impact of this project extends beyond berry production alone. By identifying production systems that can improve resilience, extend harvest windows, and support more consistent yields, the research has the potential to strengthen domestic food production, reduce reliance on imported fruit, and create new opportunities for growers to access higher-value markets. More resilient production



Why Protected Production Matters

Protected production systems can:

- Extend harvest seasons
- Improve climate resilience
- Reduce weather-related risk
- Increase domestic berry availability
- Create opportunities for premium market access
- Wood-fibre substrates performed comparably to conventional coco coir systems in raspberry production trials.

Potential benefits:

- Reduced reliance on imported growing media
- Improved supply chain resilience
- More sustainable production inputs

systems can also help growers better manage the increasing risks associated with climate variability while providing retailers and consumers with a more reliable supply of locally grown berries.

A key outcome of the project which is slated to end in March 2028, is the generation of practical, science-based information that supports grower decision-making and accelerates technology adoption. Through comprehensive monitoring of plant growth, yield, fruit quality, environmental conditions, irrigation performance, and pest pressures across multiple berry varieties and production systems, Vineland is developing evidence-based production guidelines and decision-support tools tailored to Canadian growing conditions. By combining applied research with commercial-scale validation and strong industry partnerships, the initiative is helping build the knowledge, confidence, and business case needed to support the future of protected berry production in Canada.



Jason Henry, MSc.

Tool #1 – Soils and Substrate Laboratory

How do you select a substrate for a crop traditionally grown in soil? A key component of Vineland's berry research is the development and evaluation of substrates specifically engineered for container-grown raspberries under Canadian conditions. As production systems intensify, understanding and managing root-zone conditions is increasingly important for optimizing plant productivity.

This work is supported by Vineland's Soil and Substrate Laboratory, where advanced analytical tools, including a state-of-the-art carbon-to-nitrogen (C:N) analyzer, enable precise measurement of substrate properties. These analyses provide insight into organic matter quality, nutrient cycling, substrate stability, and microbial activity, all critical factors influencing fertility management and long-term growing media

> *"Vineland is helping build the knowledge and confidence needed to support the future of protected berry production in Canada."*

performance. This capability allows Vineland to rigorously evaluate both soil and soilless systems and develop science-based recommendations for industry.

This year, Vineland's soil and substrate research team has been assessing novel substrates for raspberry production, evaluating factors such as fertilizer use, water dynamics, crop growth, and yield. The goal is to determine their suitability for commercial production while ensuring they can be sourced and scaled within Canadian supply chains.

Working with substrate suppliers, Vineland is testing innovative growing media, including wood fibre-based blends and alternatives to peat and coco coir. The research also explores the reuse of spent stone wool from greenhouse vegetable production. After use in crops such as tomatoes, cucumbers, and peppers, the material is processed and incorporated into new berry-production substrates, diverting waste from landfill while creating value from existing resources.

By combining advanced analytical capabilities with applied production research, Vineland is helping improve substrate performance, support circular use of materials, reduce reliance on imported inputs, and strengthen the long-term sustainability and resilience of Canada's berry industry.



The Plant Production team setting up our experimental raspberry plots at Fenwick Berry Farm.



Young blueberry plants growing beneath solar panels.

Tool # 2 – Technology Validation: Helping Growers Adopt Innovation with Confidence

By Dan Bath, PhD.

New technologies are rapidly reshaping horticulture. Advanced sensors, automation, digital platforms, protected production systems, alternative substrates, and precision irrigation all offer opportunities to improve productivity, labour efficiency, crop quality, and sustainability. However, adoption is rarely straightforward. New technologies often require significant capital investment, operational changes, staff training, and confidence that they will perform reliably under commercial conditions.

"Growers are more likely to adopt solutions when performance is demonstrated, risks are reduced, and the value proposition is clear."

For AgTech and digital horticulture, independent validation is particularly important. Technologies such as internet of things (IoT) networks, spectral imaging, and data platforms can generate large volumes of information, but their value depends on whether they deliver reliable, actionable insights that improve decision-making.

Vineland helps bridge the gap between promising innovations and commercial adoption through independent technology validation. While many technologies perform well in early demonstrations, growers need objective evidence that they work within Canadian production systems, crops, and economic realities. Validation studies assess performance, limitations, best-fit applications, and return on investment (ROI), often the deciding factor in technology adoption.

As technology adoption becomes increasingly important for food security, productivity, and supply chain resilience, governments are investing in validation and demonstration programs that help innovations move from concept to commercial use. These programs reduce the cost and risk of evaluation for growers while providing technology developers with access to trusted third-party testing and performance data.

Initiatives such as the Critical Industrial Technologies Initiative, supported by the Government of Ontario and delivered through the Ontario Centre of Innovation (OCI), are helping accelerate commercialization. As a Technology Development Site, Vineland provides companies with a pathway to advance through technology readiness levels while generating credible, independent validation.

By combining commercial-scale testing, objective evaluation, and industry expertise, Vineland helps reduce adoption risk, build grower confidence, support innovation companies, and accelerate the deployment of technologies that strengthen the competitiveness and resilience of Canada's horticulture sector.

Crop Production:
Climate Adaptation & the Role of Metabolomics



Rose Buitenhuis, PhD.

Invasive pests and diseases are creating urgent challenges for Canadian horticulture. Growers need practical tools, decision-enabling evidence, and integrated strategies that help them respond quickly while protecting crop quality, profitability, and long-term resilience.

Invasive species pose a risk across the whole horticulture sector. Greenhouse crops are dealing with threats such as Thrips parvispinus and Tomato brown rugose fruit virus, while nursery, landscape, vegetable and fruit sectors are identifying priorities around species such as spotted lanternfly, oak wilt, hemlock woolly adelgid and late blight. Some of these species are already established in parts of Canada and regulations may be in place for the bugs to prevent further spread, while others are identified as "most likely to invade" and management efforts focus on preventing their entry and early detection.

There are two main drivers of invasion: global trade and climate change. Global trade in plant material has increased the risk of pests and diseases being introduced beyond their natural range. For example, the tropical pest T. parvispinus has spread from Southern Asia to many parts of the world through infected propagative material, while the spread of Spotted Lanternfly (SLF) has been linked to shipments of landscaping materials such as rocks or timber. Climate change is expanding the geographic range of invasive pests and diseases such as late blight or soybean aphids that previously could not survive or thrive in certain areas of Canada.



Mass spectrometry reveals detailed chemical insights.



Research Scientist, Valerio Primomo, PhD. inspects tomatoes on the vine (TOVs).

The rise of invasive species is expanding the crop protection research agenda across Canadian horticulture. Emerging pests and pathogens are increasing the need for stronger surveillance, practical diagnostics, rapid efficacy screening, host resistance assessment, disinfection methods, and implementation guidance suited to real production systems. Invasive species are also creating demand to evaluate new technologies, including computer vision, molecular tools, such as metabolomics, and precision application of crop protection products, in ways that support earlier detection and more informed decisions. In addition to generating credible evidence quickly, it is important to assess how new tools fit within integrated pest management (IPM) programs, identify risks and trade-offs, and support adoption under Canadian conditions. The vision is not only to manage the next invasive threat, but to build a more responsive system that can detect problems earlier, test solutions faster, and move effective strategies into practice.

"Growers need practical tools, decision-enabling evidence, and integrated strategies that help them respond quickly while protecting crop quality, profitability and long-term resilience."

The first step to finding a solution is research on pest and pathogen biology. Understanding the life cycle, host range, vulnerable stages, and pathways of spread is essential for designing monitoring and management strategies. This kind of work helps identify where intervention is most likely to succeed and where prevention efforts can reduce risk before major losses occur. For example, Vineland's T. parvispinus research showed that disinfection of incoming plant material through cutting dips, cold treatments, or steam treatments could help prevent population establishment. The work also identified resistant and susceptible plant varieties and examined defensive behaviour against predators to better understand why biological control was not always effective.

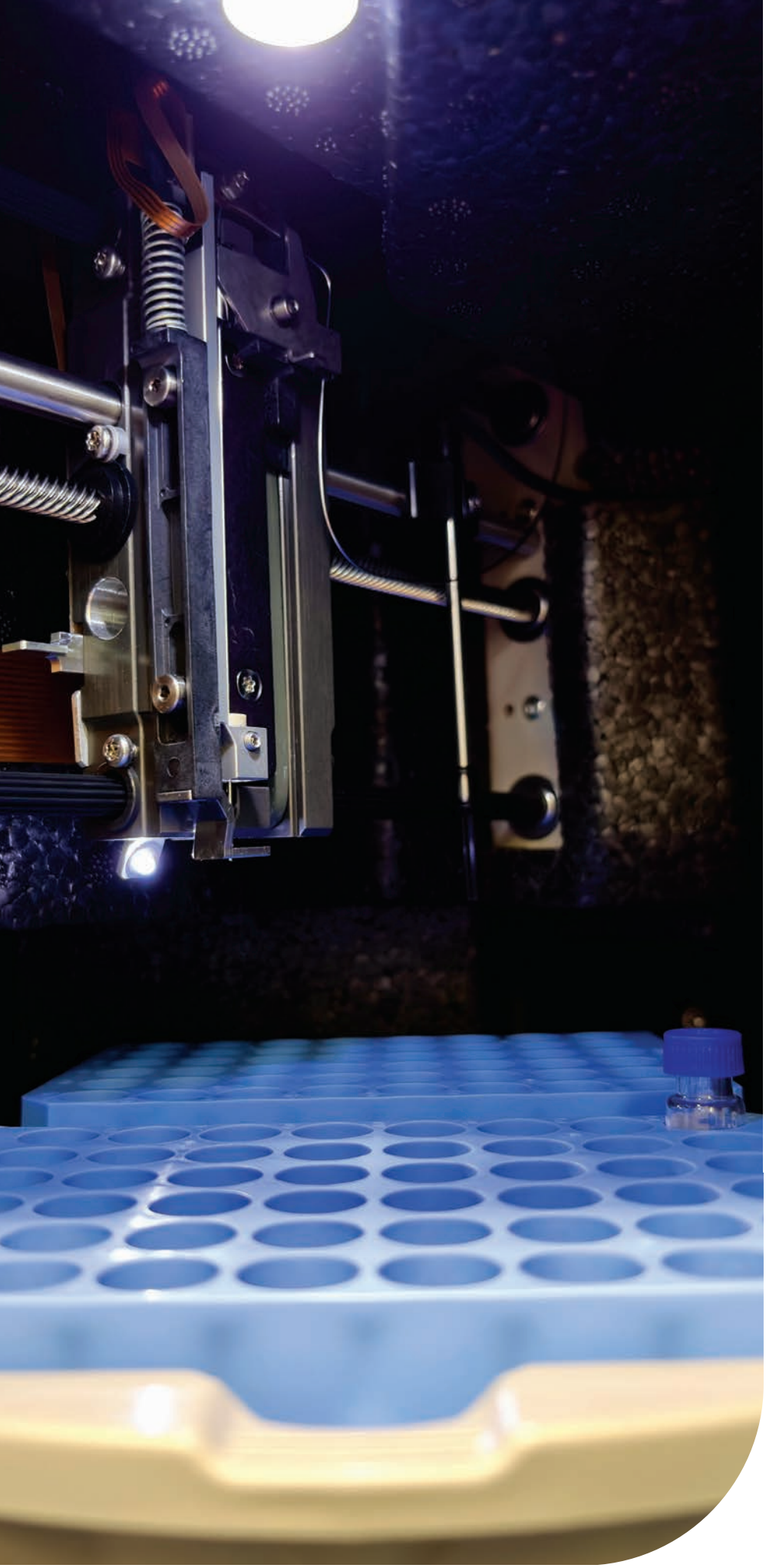
The second step is to develop reliable detection and monitoring. Growers need practical systems for identifying threats early, and currently rely on visual inspection, pest and spore trapping, manual sampling and laboratory diagnostics. There is significant potential to improve how pests and diseases are detected using new technology such as computer vision, drones, metabolomics and other molecular tools. The industry needs clear pest identification resources, especially for new, unfamiliar pests or species that may resemble established pests. Action thresholds, and where possible economic thresholds, are needed to guide timely intervention and avoid unnecessary crop protection inputs.

The third step is to expand and validate the crop protection toolbox available to the industry. This includes testing biologicals, reduced-risk products, selective synthetic pesticides, disinfectants, resistant germplasm, and technology-enabled solutions under Canadian conditions. For example, Vineland has conducted several Minor Use Trials through the Pest Management Centre, a division of Agriculture and Agrifood Canada, including testing product efficacy against spotted lanternfly, with the goal of generating data to support product registration or label expansion. Because crops are often affected by multiple pests and diseases at the same time, Vineland also evaluates whether new tools are compatible with existing IPM programs, including compatibility testing of biocontrol agents and biopesticides. This kind of work helps ensure that new solutions can be adopted effectively within real production systems.

Finally, effective biosecurity protocols and tools are needed to limit the further spread of emerging pests and diseases. For example, in a ToBRFV disinfection trial, disinfectant and cleaning products were evaluated at Vineland under controlled conditions to assess their effectiveness against this persistent virus.

Addressing emerging invasive pest and disease threats requires more than technical advances. It requires a coordinated approach that can rapidly move knowledge, tools, and solutions into practice. Vineland brings together the expertise, technologies, and evidence needed to support timely decision-making across the sector. Vineland can help identify new threats early, test products and strategies under Canadian conditions, and develop clear guidance for on-farm and greenhouse use. Collaboration across the sector makes it easier to generate the data needed for registration or label expansion, improve rapid response options, and provide growers with validated tools, training, and recommendations that reduce risk, protect crops, and support adoption and resilience of Canadian horticulture.







David Liscombe, PhD.

Tool # 1 - Metabolomics

Metabolomics examines the chemical compounds plants produce in response to their genetics and environment. By measuring these signals, Vineland can understand how plants respond to stress, pests, diseases, and production conditions, often before visible symptoms appear.

This capability adds a valuable layer to crop protection and invasive species research. Conventional studies measure how pests or pathogens respond to treatments but reveal less about the biological processes causing those effects. Using high-throughput platforms such as mass spectrometry, metabolomics detects and interprets small molecules associated with pest feeding, infection, treatments, and other stresses. Vineland's recent work with University of Toronto collaborators, for example, shows that metabolomics can identify stress-associated compounds and defence pathways activated by biostimulant microbes in soil. [1]

These insights create several practical opportunities. Metabolomic signatures can help screen plant varieties for resistance or susceptibility, accelerating the identification of material less likely to support

1 Loranger et al (2026): https://onlinelibrary.wiley.com/doi/full/10.1111/pce.70495

pest or pathogen establishment. They can also reveal how crop protection products, biostimulants, and cultural practices influence plant defences, improving understanding of mode of action and fit within integrated pest management programs. Metabolite-based markers may further support early-warning diagnostics and decision tools that distinguish biotic stress from other crop problems. Together, these applications can help detect threats earlier, prioritize promising solutions, and strengthen evidence for implementation under Canadian conditions.

Vineland is positioned to translate metabolomics from an advanced scientific technique into practical horticultural solutions. By integrating this capability with crop protection, plant breeding, production systems, technology validation, and commercialization, Vineland can apply it across the innovation pipeline. The resulting insights can improve diagnostics, accelerate breeding for stress tolerance and disease resistance, clarify how biological inputs and production practices affect plant health, reduce unnecessary inputs, and support more precise management decisions. Ultimately, metabolomics can provide growers with tools that improve productivity, resilience, and sustainability across Canadian horticulture.

Tool # 2 –Technology Implementation: Connecting Sensing, Data and Automation for Horticulture

By Dan Bath, PhD.

Technology adoption in horticulture depends not on a single tool, but on how technologies work together to solve production challenges. At Vineland, this is achieved by integrating three connected areas of expertise: advanced sensing, data science, and automation.

Advanced sensing provides detailed, consistent measurements of crop and production system performance. Technologies such as spectral imaging, computer vision, environmental sensors, and IoT networks enable growers and researchers to monitor crop growth, stress, and production conditions beyond what is possible through manual inspection alone.

Data science converts these measurements into actionable information. Artificial intelligence, large language models, predictive analytics, and advanced statistics help identify patterns within complex datasets generated from sensors, images, climate systems, crop records, yield data, and scouting observations. The value lies in connecting these data streams to support clearer, more informed decisions.

Automation enables those decisions to be implemented more efficiently. Robotics, drones, automated imaging systems, and precision application technologies can reduce labour requirements, improve consistency, and support targeted crop management. Applications range from pest management and irrigation to crop health monitoring, yield estimation, and evaluation of new production systems.

The challenge is ensuring these technologies are practical, reliable, affordable, and compatible with commercial operations. Adoption depends on demonstrating measurable value through labour savings, improved crop quality, reduced inputs, better decision timing, or lower production risk. Vineland helps growers and technology developers assess return on investment and identify solutions that are both innovative and commercially viable.

A practical example is robotic harvesting for greenhouse vegetables, where sensing, data science, and automation work together to identify, assess, and harvest fruit. This research helps define both the technical requirements and economic realities needed for successful commercial adoption, accelerating the deployment of advanced technologies across horticulture.

INVASION DRIVERS

Two major forces are increasing pest and disease risk:



Global Trade

- Increased movement of plant material
- New pathways for pest introductions



Climatic Changes

- Expanding pest and disease ranges
- Greater survival of invasive species in Canada

Post Harvest:
Preserving Quality & Protecting Value



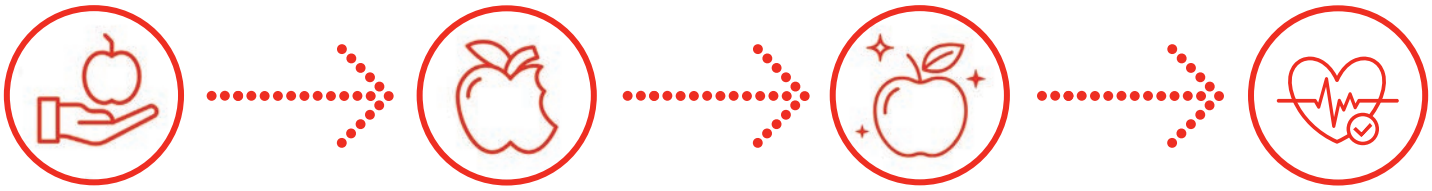
Rachael LeBlanc, MSc.

Post-harvest performance plays a pivotal role in the reliability, efficiency and overall value retention of horticultural supply chains. Across fruits, vegetables and specialty crops, a significant share of product value is determined not at harvest, but in the period between harvest and consumption. Ensuring that quality is preserved throughout storage, transport and distribution is critical to meeting market expectations and maintaining competitiveness in both domestic and global markets.

While different crops vary in shelf life and handling requirements, many horticultural products now move through increasingly complex supply chains and are often in storage for extended periods. This makes the ability to maintain quality attributes such as texture, flavour, appearance, and nutritional value essential. Apples illustrate this challenge well. Their long storage periods, often extending for months after harvest, make post harvest performance a major determinant of marketability, profitability, and food waste. While apples have become a model crop for post harvest research, many of the same challenges apply across berries, stone fruit, leafy greens, and greenhouse crops, where maintaining quality through increasingly complex supply chains is equally important.

Post-harvest outcomes are influenced well before the fruit enters storage. Decisions around variety selection, orchard management, and harvest timing all influence how horticultural products respond to storage and transport conditions. Increasingly, innovation efforts are focused on linking pre-harvest decisions to post harvest performance. Breeding and selection programs are prioritizing traits such as firmness retention, disease resistance, reduced physiological disorder incidence, and consistency across production environments.

POST HARVEST CONSIDERATIONS



These traits are becoming more valuable as the supply chain environment grows more complex. Horticultural products are now expected to travel longer distances to reach domestic and international markets, increasing exposure to variable conditions. At the same time, climate unpredictability is affecting growing seasons and fruit maturity, which in turn impacts storage behaviour. Market volatility adds another layer of complexity, requiring producers and distributors to hold fruit longer or redirect shipments. Varieties with strong post harvest performance provide flexibility and resilience in the face of these pressures.

Improving post harvest outcomes is also a practical and impactful way to reduce food loss and waste. A substantial proportion of losses in horticulture occur after harvest due to softening, spoilage, and storage disorders represent avoidable inefficiencies across the supply chain. These losses represent not only missed economic opportunity but also inefficiencies in land, water, energy, and labour use.

Strengthening post harvest performance, through both better genetics and improved storage practices, offers immediate and scalable opportunities to help preserve quality while ensuring more of the harvested crop reaches consumers. This aligns with broader priorities around sustainability, food security, and resource efficiency.

At the same time, advances in post harvest science and technology are reshaping what is possible. Controlled atmosphere storage, precision cooling, sensing technologies, and data-driven supply chain management are improving visibility and control over product condition. When combined with insights from genomics and physiology, these tools allow for more tailored strategies, matching specific varieties or crop types to optimal storage and distribution pathways.

As risks evolve, so too must the approach to managing them. Integrating genetics with post harvest science is increasingly important. Laboratory research helps identify how different varieties respond to storage conditions, enabling more informed decisions that connect breeding programs with supply chain needs. This creates a more adaptive system that can respond to emerging challenges while maintaining quality standards. Vineland will continue to assess market opportunities in post harvest innovation and processing, while leveraging genomics to accelerate the development, selection, and commercialization of high-performing varieties tailored to market and industry needs.



The Journey of an Apple











Tool #1 – The Role of Genetics

By Rachael LeBlanc, MSc.

Genetics are a primary driver of post harvest success, and at Vineland this focus begins at the very earliest stages of our apple breeding project. Starting with seedlings, we apply marker-assisted selection to identify and remove genotypes that lack the genetic potential for key traits such as firmness retention, flavour, and storability. By eliminating inferior genotypes early, we deliberately enrich our breeding populations with high-potential selections that are far more likely to perform well after harvest and meet long-term storage demands.

As selections advance, Vineland integrates a series of structured storage evaluations to rigorously assess post harvest performance. All fruit entering the selection pipeline is first placed in cold storage for a minimum of two weeks before any texture or sensory assessments are conducted. This step serves as an initial screen, any apple that fails to maintain quality over this short period is removed, as it is unlikely to succeed in longer-term storage.

For selections that pass this threshold, Vineland evaluates fruit throughout the storage period to monitor how firmness, texture, and flavour change over time. This ongoing assessment provides a clear picture of each genotype's storage trajectory. Selections predicted to have high consumer appeal that pass the initial storage screening are then advanced into Vineland's Controlled Atmosphere (CA) pod system. In these trials, fruit is stored for up to eight months and assessed at two-month intervals. Apples that consistently maintain excellent texture and eating quality under these conditions have their trees advanced for evaluation at growers' farms across Ontario and beyond.



While Vineland has established a strong foundation for predicting post harvest success, further work is needed. Vineland is collaborating to perform larger-scale CA storage trials involving thousands of apples to validate performance under commercial conditions for the elite genetics. Additionally, understanding how production practices and harvest timing interact with genetic potential will be critical to optimizing storage outcomes and ensuring reliable post harvest success.

Stay tuned for Vineland's first apple release in 2028.



Amy Blake, MSc.

Tool #2 – The Role of the Sensory Lab

Vineland integrates sensory science into its apple breeding research to better understand post harvest performance and support the development of varieties with strong consumer appeal. Sensory evaluations are conducted in a dedicated tasting facility equipped with individual booths that help minimize bias and allow assessors to focus on aroma, taste, texture and appearance. Evaluations are completed by Vineland's trained sensory panel, a group of 17 individuals selected for sensory acuity and trained in methods such as descriptive analysis, which defines flavour profiles using a structured lexicon of product attributes.

For apples, the panel assesses 18 aroma, flavour, taste and texture attributes to profile new selections and benchmark them against commercial standards at different post harvest time points. Positive indicators include sweet and juicy, while attributes such as earthy flavour and mealy texture may indicate poorer post harvest performance. These sensory data sets are also integrated with consumer research to better understand and predict apple preference, strengthening Vineland's ability to advance selections that align with consumer liking.

During early-stage variety screening, Vineland also uses a separate internal panel of 12 staff members trained to identify apples with high consumer appeal based on traits such as crispness, juiciness, sweet taste and the absence of off-flavours. This in-house apple panel operates independently from the trained sensory panel and helps identify promising selections earlier in the breeding pipeline.

These tools track how apple flavour profiles evolve through breeding and storage, which is especially important for fruit that may be stored for up to a year before reaching consumers. Similar approaches have been applied to sweet potatoes, tomatoes, tender fruits, pears and strawberries. Consumer acceptance is ultimately shaped by the eating experience. Regardless of how well a variety performs in production, its success depends on delivering the flavour, texture, aroma and appearance that consumers value. Consumer research helps identify the attributes that drive purchasing decisions and repeat consumption, while sensory science provides the tools to objectively measure and understand those characteristics. These approaches generate insights that support the development of varieties capable of meeting market expectations and maintaining quality throughout storage and distribution.



Darby McGrath, PhD.

The Innovation System in Action: Turning Strategy into Sector Impact

Why This Strategy, Why Now

On April 1, 2026, Vineland launched our next Innovation Strategy. For us, this is more than a new plan on paper. It is an exciting moment because it builds directly on the work already moving through our innovation process while giving us permission to lean into the next generation of tools, platforms, and relationships the sector will need.

The goal is clear: innovation must reach growers and the supply chain in ways they can use. Success will not be measured only by ideas generated, projects completed, or reports published. Success will be growers adopting the tools they need to improve productivity, manage risk, and compete with confidence. Their success is our success, and it is also how Vineland contributes to the ambitions of Grow Ontario.

The need for this approach is urgent. Across horticulture, climate volatility is already shaping production decisions. Labour remains constrained. Input costs are rising. Pest and disease pressures are shifting. At the same time, data, automation, robotics, artificial intelligence, genomics, gene editing, and new biological tools are advancing quickly, but their application is often unsure or untested. These technologies hold real promise, but promise alone does not create impact. For growers, the practical question is always the same: will this work in my crop, in my system, and in time to matter?

That is why Vineland's Innovation Strategy is built around an end-to-end system. We are connecting market and consumer insight, science, validation, commercialization, demonstration, knowledge transfer, and adoption. The work starts by understanding what the sector needs and what the market will value. It then moves upstream into variety development, crop protection, production systems, post harvest performance, technology validation, and data-driven decision-making.

Connecting the System End-to-End

This integrated, end-to-end approach to innovation matters because food supply is built one decision at a time. Long before a product reaches a grocery shelf, choices have already determined whether it can be grown reliably, protected from emerging threats, stored successfully, accepted by the market, and adopted with confidence by the people who produce it. Vineland's role is to connect those choices so science, industry, and government are not working in separate lanes, but as part of one coordinated pathway from need to impact.

The same pathway helps explain how Vineland delivers on Grow Ontario and Protect Ontario. Grow Ontario calls for stronger supply chain stability, increased production, greater innovation adoption, better use of data, and research that moves into the field, the marketplace, and the broader supply chain. Protect Ontario reinforces the need for resilience in the face of climate, pest, disease, labour, and market pressures. Our strategy helps Ontario succeed by turning those priorities into practical horticulture action.

In practice, this means helping the sector develop better crops, validate better tools, and make better decisions. Seed sourcing, secure supply, intellectual property, genomics, and variety development strengthen the front end of the pipeline. Production research, AgTech support, soil and substrate services, and controlled environment expertise help turn potential into performance. Crop protection and metabolomics provide earlier signals of pest, disease, and climate stress. Postharvest science, food lab capability, storage research, and product testing help ensure that innovation can survive the full journey from production to market.

What connects these pieces is adoption. Vineland is not simply producing research outputs. We are building confidence. Through technology validation trials, market intelligence, commercialization support, demonstration platforms, advisory services, training, and knowledge transfer, we help growers and the supply chain understand what works, what is worth investing in, and how to move forward with less risk.

Where Strategy Becomes Action

Building on Vineland's current and historical work, our newly launched Strategic Initiatives are where this system becomes focused.



Digital Horticulture responds to the sector's need for trusted pathways to use data, automation, sensors, robotics, artificial intelligence, and decision-support tools. Growers are being asked to make faster and more complex decisions, often with limited ability to test whether a technology will work in their production system. Through digital readiness, sandbox validation, demonstration, and decision-support development, Vineland helps turn technology from promise into something that can be assessed, trusted, and used.



Climate-Resilient Crops and Gene Editing responds to the need for more reliable production in a less predictable climate. Weather variability, shifting pest and disease pressure, and changing market expectations are increasing demand for crops with stronger performance, resilience, and quality. At the same time, gene editing in horticulture is still nascent. Many crops remain underserved by the high-throughput platforms available for large commodity crops. Vineland helps close that execution gap by building a staged pathway from trait discovery to precision development, validation, and breeder-ready outcomes.



Metabolomics-Driven Pest and Disease Management responds to the sector's need to anticipate risk earlier and manage crop protection with greater precision. As pressures increase and traditional tools become more constrained, growers need better signals before problems become visible losses. By detecting plant responses earlier, this initiative supports more targeted interventions, stronger diagnostic capability, and future decision-support tools that can help protect production before crisis points are reached.

The three strategic initiatives align with priorities identified by growers, industry stakeholders, and government through the 2026-2029 OMAFA Research Priority Setting process, reinforcing the key challenges and opportunities facing Ontario's horticulture sector. The challenges are too interconnected to be solved through isolated projects alone. Growers need coordinated platforms that reduce uncertainty, strengthen resilience, and accelerate adoption. Government and industry need evidence that public and private investment is translating into practical outcomes. Ontario needs innovation that supports stronger supply chains, higher productivity, more competitive businesses, and technologies that can move into domestic and global markets.

"Success will be growers adopting the tools they need to improve productivity, manage risk, and compete with confidence."

What Success Looks Like

Over the next three to five years, success will be visible in measurable change across the sector. New tools will move beyond pilots into everyday decision-making. New varieties and practices will not only enter the market; they will perform under commercial conditions and be used at scale. Growers will have better information, stronger options, and more confidence to adopt new processes and/or technologies. Industry, government, and research partners will be more aligned around shared priorities and able to move faster together.

We know we are on the right path, and that is exciting. The Innovation Strategy gives Vineland a clear way to build on what is already working, push into new areas where the sector needs leadership, and stay focused on the outcome that matters most: adoption. When growers have the tools they need to succeed, Ontario is better positioned to grow, compete, and lead. For Vineland, that is the real win.

Driving Impact:
Embedding ESG into Vineland Operations & Innovation

In 2025-26, Vineland continued to advance its Environmental, Social and Governance (ESG) Framework, moving from establishing goals and metrics to demonstrating measurable progress across priority ESG factors. Through ongoing investment in its people, operations, and governance practices, Vineland strengthened its commitment to sustainability while supporting the long-term competitiveness and resilience of Canada's horticulture sector.

Key focus areas included:

Environmental

- Energy Management
- Water Use Management
- Waste Management

Social

- Workplace Safety
- Employee Health and Well-being
- Human Capital Development
- Employee Retention
- Community Relations

Governance

- Client Relations
- Equity, Diversity, and Inclusion (EDI)
- Board Governance and Accountability

2025-26 Progress and Priorities

Considerable progress was made across all three ESG pillars, with notable successes in waste management, employee well-being and retention, community relations, and governance. This year's ESG Report highlights how Vineland continues to turn ESG commitments into meaningful action while identifying opportunities for continued growth and improvement.

Environmental Aspect

Vineland continued to strengthen its environmental stewardship through targeted investments in energy efficiency, water conservation, and waste reduction. Four greenhouse compartments were converted to LED lighting, building control systems were upgraded, and planning advanced for the replacement of the North Building HVAC system. Water management improvements focused on maintaining and enhancing lake water infrastructure and greenhouse cistern systems to improve operational efficiency and responsible water use.

Waste management remained a significant success. Vineland reduced waste sent to landfill, implemented 100% organic recycling procedures with its waste management contractor, reduced chemical waste disposal requirements, and maintained its long-standing record of zero chemical spills.

CALLOUTS

- Four greenhouse compartments converted to LED lighting
- Significant reduction in landfill waste
- 100% organic recycling procedures implemented
- Zero chemical spills

Social Aspect

Vineland continued to prioritize employee health, safety and development while strengthening its contribution to the communities it serves. Enhanced incident and near-miss reporting resulted in increased reporting activity, while the severity of incidents declined, supporting a stronger culture of prevention and continuous improvement.



Investment in human capital continued to grow through increased training opportunities and professional development support. Employee retention improved year-over-year, employee satisfaction remained high, and recruitment efforts enabled Vineland to continue meeting operational and client needs.

Community impact remained strong. Through employee-led initiatives and crop donation programs, Vineland donated approximately 41,000 pounds of fruit and vegetables to local food banks and community organizations throughout 2025-26.

CALLOUTS

- Improved employee retention
- Increased investment in professional development
- 41,000 lbs of produce donated to community organizations
- Reduced incident severity through enhanced safety reporting

Governance Aspect

Vineland maintained strong governance performance through effective Board oversight, accountability, and transparency. Client satisfaction remained high, supported by a 70% returning client rate and increased revenue per scientist as efforts to diversify and strengthen revenue streams continued.

Vineland also advanced its commitment to equity, diversity, and inclusion through ongoing development of meaningful metrics and initiatives that support a diverse and inclusive workplace. Cybersecurity and privacy remained a priority, with continued investment in employee awareness, testing, and system security. Vineland maintained a clean breach record in 2025-26.

Board governance remained strong, supported by annual Board satisfaction reviews, robust internal controls, effective financial oversight, and ongoing ethics and transparency practices.

CALLOUTS

- 70% returning client rate
- Zero privacy breaches
- Annual Board effectiveness review completed
- Continued advancement of EDI initiatives

Looking Ahead

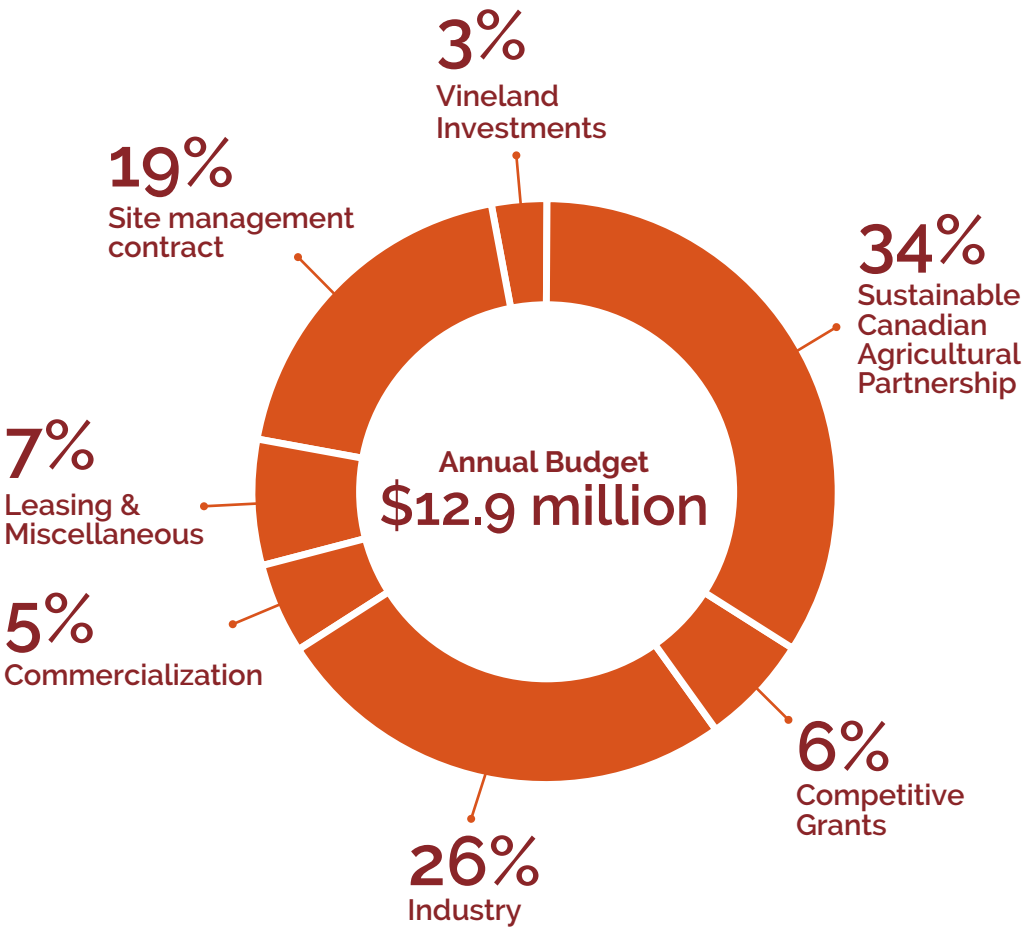
As Vineland continues progressing toward its 2030 ESG goals, priority areas for focus include enhancing workplace safety through lessons learned from near-miss reporting, strengthening human capital development and career advancement opportunities, improving employee retention and satisfaction, and continuing to diversify revenue streams and commercialization opportunities.

Vineland's commitment to ESG remains embedded throughout its operations and innovation activities. The progress achieved in 2025-26 reflects the dedication of its employees, the support of its stakeholders and a shared vision of creating long-term environmental, social, and economic impact. Building on this momentum, Vineland will continue advancing its ESG Framework while creating value for employees, stakeholders, the horticulture sector, and the communities it serves.



Vineland at a Glance

Revenue April 1, 2025 - March 31, 2026



Commercialization since 2007

4
Vineland developed technologies with patents issued/filed

14
trademarks registered/filed

32
plant varieties with Plant Variety Protection issued/filed in Canada

76
per cent of Vineland's protected IP is commercialized or under further collaborative R&D with business partners

Partnerships

411 total*

373 industry

9 academic

29 government

From

9 Canadian Provinces
(Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Québec and Saskatchewan)

17 Countries
(Canada, United States, New Zealand, Switzerland, India, Malaysia, The Netherlands, Belgium, Germany, United Kingdom, France, Australia, Israel, Norway, Sweden, Spain, Finland)

As of April 1, 2025 – March 31, 2026

Research Capacity and Performance

12
research scientists

$217,293
research intensity (research revenue generated per researcher)*

$44,393
innovation strength (royalties generated per researcher)*

42%
proposal success rate*

As of April 1, 2025 – March 31, 2026

Job Creation, Education and Training

77.5
full-time employees

57
highly qualified positions

3
PhD Students

As of April 1, 2025 – March 31, 2026



May Chang, Board Chair

Vineland's Board of Directors (2025-26)

May Chang
Board Chair

Tony DiGiovanni
Board Vice Chair/Chair, Governance and Human Resources Committee

Ian Potter, PhD, FCAE
President and CEO/Chair, Innovation Advisory Council

Liz Stokes,
Board Director/Chair, Stakeholder Advisory Council

Mark Picone
Board Director/Chair, Business Development Committee

Angela Zangari
Board Director/Chair, Finance and Audit Committee

John Groenewegen, PhD
Board Director

Derek Lothian
Board Director

Rick Mastronardi
Board Director

Scott D'Cunha
Board Director

Lori Hall
Board Director

Glen Price
Board Director

vineland
RESEARCH & INNOVATION CENTRE

Vineland Research and Innovation Centre is a uniquely Canadian results-oriented organization dedicated to horticulture science and innovation. We deliver innovative products, solutions and services through an integrated and collaborative cross-country network to advance Canada's research and commercialization agenda.

Vineland is situated on treaty lands. These lands are steeped in the rich history of the First Nations including the Hatiwendaronk, the Haudenosaunee, the Anishinaabe and the Mississaugas of the Credit First Nation. Many First Nations, Métis and Inuit people from across Turtle Island live and work in Niagara today. Vineland stands with all Indigenous people, past and present, in promoting the wise stewardship of the lands on which we live.

We are an independent, not-for-profit organization, funded in part by the Sustainable Canadian Agricultural Partnership (Sustainable CAP), a five-year, federal-provincial-territorial initiative. The property and, in part, buildings at the Vineland Research Station are owned by Agricultural Research and Innovation Ontario, an agency of the Government of Ontario.

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