

THE **2023-2024** INNOVATION REPORT

**08 Delivering global
innovation, genetics
and intellectual
property to
Canadian growers**

**10 Expanding the reach of
bred-in-Canada roses**

**17 Searching for solutions against
different thrips species affecting
Ontario greenhouse crops**

vineland
RESEARCH & INNOVATION CENTRE

Bridging the innovation gap with discovery and commercialization

For over 117 years, the Vineland Station, now managed and operated by Vineland Research and Innovation Centre (Vineland), has supported the Canadian horticultural industry and government stakeholders in creating innovation opportunities. As a result, Vineland has grown to become Canada's most successful research and technology organization (RTO) dedicated to horticultural innovation by actively assisting and engaging stakeholders with focused and effective outcome-based research, development and commercialization support.



Ian Potter, PhD, President & CEO

Vineland and its employees are proud of this success but we know sector challenges and opportunities in a post-pandemic world, will make our mission more relevant than ever.

The Vineland 2023-2026 Strategic Plan and associated Innovation Strategy address these challenges and opportunities by clearly defining and understanding the Canadian horticultural economic sector, our clients' markets and their operational requirements in order to provide the innovative response to promote growth of the horticultural industry. Specific Innovation Strategy goals are to:

1. Diversify and enhance horticultural products for domestic and export markets.
2. Ensure new technologies are optimized for the Canadian environment.
3. Improve the connectivity of products and processes across supply and value chains.

Vineland also places a significant emphasis and effort on the effective benefits management derived from our innovation activities. In many cases, this is enshrined as intellectual property (IP), a corporate asset held and managed for use by Vineland and our clients. The principles of our IP policy include:

- Promote and advance scientific investigation and research in horticulture.

- Facilitate technology transfer to industry ensuring Vineland's results benefit the public.
- Procedures for determining rights and obligations with respect to inventions and discoveries created at Vineland.

Over recent years, Vineland's management of our IP portfolio has also embraced a more pragmatic operating stance, incorporating:

- Flexibility and focus on outcomes and impact.
- Proper resourcing for managing the portfolio.
- A consumer- and market-focus to understand industry trends.
- Early identification of potential IP in projects to support benefits management.
- If you're not willing to invest in or defend your IP, don't start developing it.
- A need for market-based technology pull for quicker outcomes and impacts.
- Get "skin in the game" from your commercialization collaborators as early as possible.

As Vineland's innovation journey continues, we must persist in communicating accomplishments and celebrating our positive impact on the sector. Vineland's Strategic Plan builds on successes while challenging us to strive even higher recognizing:

- The strength and experience of our employee complement the capabilities of our managed research infrastructure.
- Our effective engagement with the Canadian horticultural ecosystem, including governments, industry, academia and other research technology organizations, to deliver impact to the economy and society.
- The continued support of the Government of Ontario and the Government of Canada and our commitment to show an impactful return on their investment.

Vineland has a rich and impressive history of success. We are respected by our clients, community, employees and stakeholders. In earning and maintaining this respect, Vineland must continue to support and help drive the success of the horticultural sector in Ontario and Canada.



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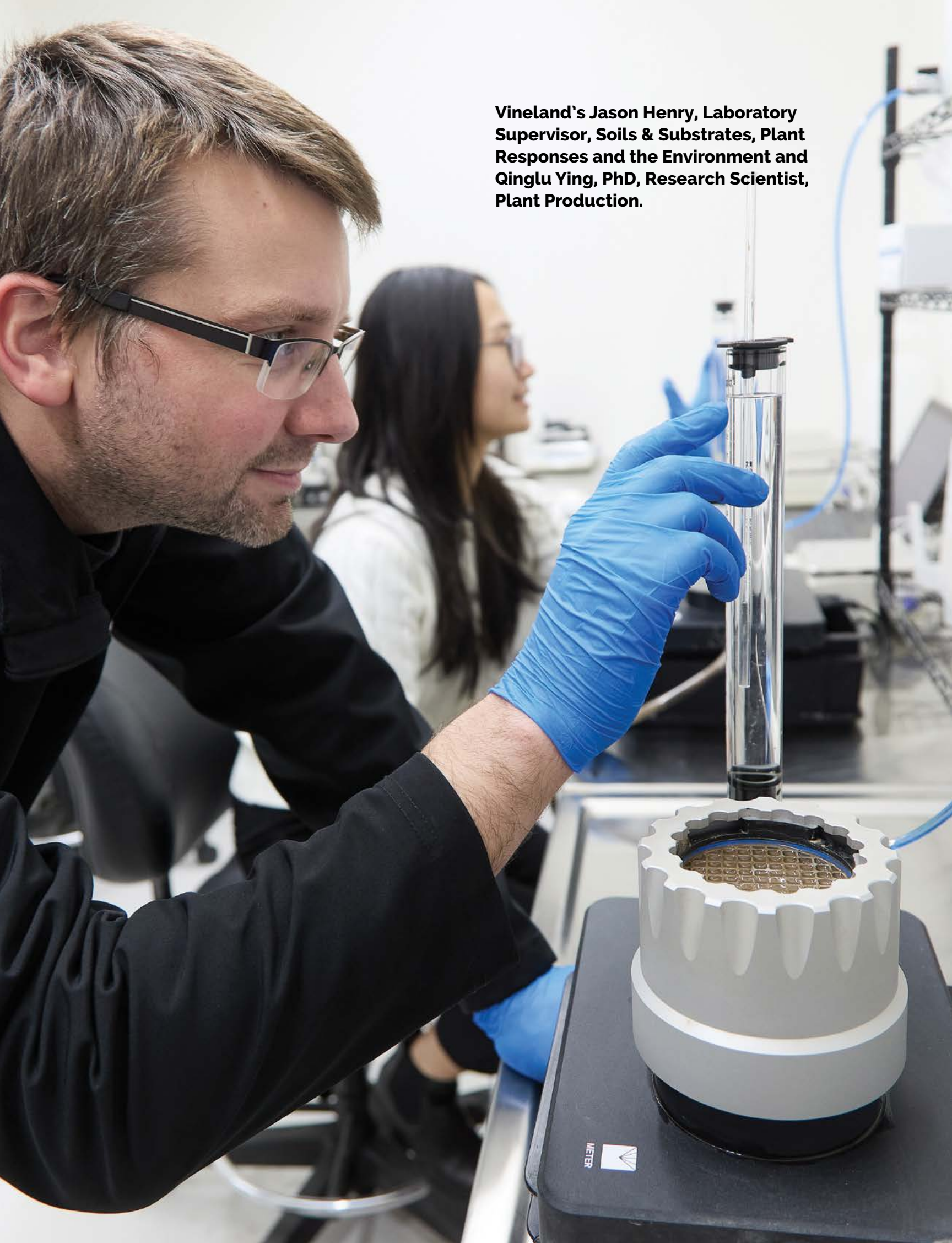
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Breaking ground on a new kind of nutrient source — insect frass fertilizer



Insect farming is a relatively new area of agriculture in Canada with great potential for growth, yet it has already been established in countries around the world. Common insect species being reared as an alternative source of protein include black soldier fly, crickets and meal worms and, just like cows, chickens and pigs that are commonly raised for protein, insects also produce a lot of manure called frass.

As an increasing number of insect farms come online in Canada, the question of how to deal with the resulting frass is one in need of a solution. And it's one that Vineland's plant production experts are helping to answer.

"Insect frass is new for Vineland but we've long had an interest in dealing with by-product streams and identifying alternative and beneficial uses for them," says Rhoda deJonge, PhD, Director, Plant Responses and the Environment. "We've become accustomed to livestock and poultry manure in agricultural applications and have established practices to using it safely, as well as, determining how it can be most beneficial to plants."

This type of information doesn't yet exist for insect frass as it's a brand-new agricultural stream that didn't previously need management. In fact, insects haven't been officially classified as livestock through government regulatory processes.

"There is a lot of work that remains to be done in insect frass compared to other animal manures, so much of this is novel and innovative," deJonge adds.

Vineland's reputation for being an innovation leader is what brought SureSource Commodities of Petrolia, ON to work together. SureSource had just recently been named a recipient under the Fertilizer Accelerating Solutions and Technology Challenge, delivered by Bioenterprise Canada and funded by the Ontario Ministry of Agriculture, Food and Rural Affairs and received funding to support their efforts to commercialize a pelleted fertilizer made from cricket frass.



Vineland's Mingshu Sun, Research Technician, Vegetable Breeding uses a drop spreader to distribute frass in a uniform consistent manner.



Experimental set-up of cucumber plants grown with different frass incorporations and top dressing treatments.

At a glance

- Insect farming is an emerging production area in Canadian agriculture and not much is known about how to manage insect manure, known as frass.
- Vineland has been working with a private sector partner to conduct base research into the composition of frass and its potential applications on various crops as a soil nutrient source.
- Vineland is well-suited to help the agricultural industry find by-product stream management solutions through its interdisciplinary innovation approach.

Using their multi-disciplinary expertise, Vineland scientists began investigating the benefits frass could offer plant production. The in-house Vineland soil laboratory looked at the benefits of different frass formulations for use in field or greenhouse vegetable production; the plant pathology team investigated pathogens, bacterial and fungal components; and the biochemistry team looked at the frass' specific metabolomic profile including chitin content.

"A lot of this basic information doesn't exist yet and Vineland offers a unique multi-disciplinary approach to answer these complex questions of what can be done with this new nutrient source," says deJonge.

Many of frass' potential uses are similar to those of other manures, such as in beneficial soil amendments for both indoor and outdoor vegetable production. And similar to other animal livestock, frass from different insect species carries different characteristics which will influence end-use formulations and applications.

This current project is ongoing and another insect frass study is underway at Vineland. According to deJonge, since the insect industry is in its infancy, this is only the beginning of the research and innovation that will be needed as the industry evolves.

Vineland's ability to innovate and provide result-based outcomes is critical to working with the Canadian industry and driving its business potential, she adds.



Aspire produces house crickets (*Acheta domesticus*).
Photo credit: Aspire.





Delivering global innovation, genetics and intellectual property to Canadian growers



Amanda Moen, Senior Business Advisor, Commercialization and Intellectual Property at Vineland.

Vineland is well known for developing and bringing new fruit and vegetable varieties to the Ontario and Canadian markets. Equally important, is its growing role as a manager of Intellectual Property (IP), finding new varieties both bred and not bred at Vineland and making them available to growers across Canada and internationally.

According to Amanda Moen, Vineland's Senior Business Advisor, Commercialization and Intellectual Property, the organization serves as the commercialization partner of other domestic breeding programs, including Agriculture and Agri-Food Canada (AAFC) and the University of Guelph, who have both been active in tender fruit breeding for many decades.

"AAFC and the University of Guelph have exclusively placed many of the products from their breeding work into Vineland's commercialization process so

the material can be distributed for trialing," Moen explains. "As a result of this unique relationship, we have become the master licensee in managing the commercialization process and bringing new varieties effectively to market."

In Ontario, Vineland partners with grower organizations like Ontario Tender Fruit and Ontario Fresh Grape Growers Marketing Board to establish on-farm trials of promising new pear, plum, peach, cherry and other tender fruit varieties. Trials are also carried out in other parts of the country through Vineland.

Successful varieties are protected and launched into the market, with Vineland and the variety owner sharing the royalties. Vineland, as a not-for-profit organization, then reinvests its share of licensing royalty revenues back into its innovation programs.

Vineland's commercialization activities aren't limited to the Canadian market. In fact, part of Moen's job is to consult with international grower networks about opportunities to commercialize varieties in other countries.

"A key goal of our IP management program is to maximize the value of our and our partners breeding programs. This means varieties that don't meet domestic needs may be desirable in other parts of the world," she says. "This helps us generate more impact for the work we do here and showcase Ontario and Canada as a leading player in the international horticultural space."

Vineland also actively scouts international breeding programs for opportunities to bring high quality genetics to Canada that will fill the gaps and meet the needs of the domestic horticultural industry — a task that is often cost-prohibitive for individual growers to do themselves.

For example, thanks to a relationship with a U.S. company, Vineland has been able to bring five new apple varieties to Canada, including the right to grow them and sub-licence production to Canadian growers. The Jupiter™ table grape, now in commercial production, also came to Canada with Vineland's assistance.

"It's not just about finding the right genetics but also about building relationships so we can help both Canadian growers and consumers," Moen says. "Vineland plays a management role, bringing together people who wouldn't otherwise be connected."

To date, Vineland has commercialized 37 tree fruit varieties on behalf of Canadian university or government breeding programs and nine new plant varieties scouted from international breeders and universities. These include Cold Snap® and Dew Drop pears, the HW624 pear (yet to be named in Canada) marketed as Happi Pear® in the U.S., the Garnet Girl™ cherry and the Jupiter™ grape.

Tree fruit breeding is a long-term commitment, with an average of a 20-year timeline for a new variety to make its way from initial breeding cross to sitting on a store shelf. Accessing international genetic material has helped Vineland make an impact for the Canadian industry more rapidly. It has also helped growers fill gaps in their production with varieties that meet earlier harvest windows, have more appealing taste profiles or better disease resistance.



At a glance

- Vineland works with Canadian government and university tree fruit breeding programs to commercialize new varieties both here in Canada and internationally. Vineland also scouts international breeding programs for varieties that could meet grower needs in Canada.
- In both instances, Vineland fills the critical role of IP manager to connect interested parties, ensure proper licensing contracts are in place and oversee commercialization activities.
- To date, Vineland has commercialized 37 Canadian and nine internationally-bred tree fruit varieties.

Gumball Goody™

Photo credit: Van Belle Nursery





Expanding the reach of bred-in-Canada roses

When British Columbia-based plant brand Bloomin' Easy® wanted to add new rose varieties to its well-known collection of plants for young homeowners, they knew Vineland would have what they were looking for.

That's because Vineland's cold-tolerant, low maintenance, disease resistant roses based on germplasm acquired from the former Agriculture and Agri-Food Canada breeding program had become well-known across the country.

"This is perfectly aligned with our approach when we are searching for products to add to Bloomin' Easy — low maintenance plants for people who don't know much about gardening," explains Bloomin' Easy Founder DeVonne Friesen. "We know that roses are one category of plant that everybody is familiar with and that homeowners seek them out but roses are also scary to people; they have a reputation for being hard to grow and maintain."

What Bloomin' Easy sourced from Vineland are two compact varieties they've named Gumball Goody™ and Cinnamon Hearts™ — long-blooming roses with bold colours that fit easily into compact modern yards and will grow in most regions of Canada, as well as, in Bloomin' Easy's markets across the United States.

Bloomin' Easy's relationship with Vineland dates back more than a decade when Vineland began breeding roses in collaboration with the Canadian Nursery Landscape Association and Van Belle — the nursery that originally started Bloomin' Easy — who became one of the pan-Canadian trial sites for the new breeding program.

"When we first started breeding roses at Vineland, we surveyed consumers and stakeholders about what people wanted to see in a landscape rose and the two main criteria identified were cold hardiness to -35°C and resistance to a leaf disease called black spot," explains Travis Banks, Director, Plant Variety Development at Vineland.

Vineland's Ashok Gosh, PhD, Senior Research Technician, Ornamental Breeding and Travis Banks, Director, Plant Variety Development. *Photo credit: Landscape Trade Magazine*





...What Bloomin' Easy sourced from Vineland are two compact varieties they've named Gumball Goody™ and Cinnamon Hearts™ — long-blooming roses with bold colours that fit easily into compact modern yards and will grow in most regions of Canada, as well as, in Bloomin' Easy's markets across the United States."

This laid the foundation for Vineland's 49th Parallel Collection of roses — Canadian Shield®, Chinook Sunrise®, Aurora Borealis® and Yukon Sun™ — that all carry those characteristics. The yellow Yukon Sun is the latest rose released under Vineland's 49th Parallel Collection banner and has been available in limited quantities in 2023, with broader availability expected for 2024.

During the development of the collection, Vineland researchers, with support from nurseries such as Van Belle and others in Manitoba, Alberta, British Columbia, Atlantic Canada and Ontario, came across other terrific varieties carrying disease resistance and offering beautiful blossoms but just couldn't meet the collection's -35°C cold tolerance requirement.

That prompted Vineland's Business Development Office to begin working on finding other commercialization opportunities for rose varieties developed at Vineland, including working directly with nursery owners to help them identify gaps in their existing rose offerings that could be filled with interesting options coming out of Vineland's national breeding trials.

"We're excited to bring some great roses like Gumball Goody and Cinnamon Hearts to Canadian gardeners and homeowners through these new avenues and let people know these roses are made-in-Canada for Canadians," says Banks.

"Our starting point is to give young homeowners confidence with these plants; the better we serve homeowners, the healthier our industry will be," adds Friesen. "It starts with low maintenance, beautiful plants and Vineland is so aligned with that vision that it is a really good fit with Bloomin' Easy."

Vineland has also been trialing more of its roses in the United States with the intent of finding opportunities south of the border for varieties that

might not suit the Canadian market but could fill some market gaps for nurseries stateside.

This is part of Vineland's general effort to expand the reach of a Canadian-based rose breeding program beyond Canada. Some of Vineland's roses are currently being trialed in Europe and Asia, for example, in hopes of expanding commercialization internationally.

Any nurseries interested in trialing Vineland-bred roses in their regions should contact Vineland's Business Development Office. A showcase garden on the Vineland campus is also available for interested parties to see some of the best varieties on display.

"It's important to trial as much of this material with as many different nurseries as possible. Roses may perform differently in different areas and various target markets also have different requirements in what they are looking for," Banks adds.



At a glance

- Vineland has bred roses known for disease resistance and low maintenance that can't meet the high threshold requirements of cold tolerance of -35°C for Vineland's 49th Parallel Collection.
- These other varieties are now available to nurseries like Van Belle, who has introduced two Vineland-bred roses, Gumball Goody and Cinnamon Hearts, to the North American market under its Bloomin' Easy brand.
- U.S. and international trials of Vineland-bred roses are also being carried out in hopes of expanding their reach into global markets.



Cinnamon Hearts™
Photo credit: Van Belle Nursery



Case Study

Understanding Canada's urban tree value

Positioning the Greening the Landscape Research Consortium for success through an extensive value chain analysis

It takes many players and steps to get from a seedling to a mature, thriving tree in an urban setting. Many factors influence this process from species selection, planting and soil specifications to municipal needs and budgetary realities. In essence, an entire value chain of participants is needed.

To help better understand the scope of value chain membership and encourage greater collaboration on industry specific research priorities, Vineland's Consumer, Sensory and Market Insights team led by Amy Bowen conducted stakeholder consultations to discern and reveal connections along the supply chain and address gaps and opportunities to strengthen collaboration, planning and knowledge mobilization.

Results from this value chain sector analysis supported the need for a new collaboration model to best support the industry. This led to the creation of Vineland's Greening the Landscape Research Consortium.



Amy Bowen, PhD, Director, Consumer, Sensory and Market Insights

"Our research results informed the needs of the Greening the Landscape Research Consortium and laid a foundation for the right model — the consortium approach — to understand who needs to be involved and how they can work together," says Amy Bowen, PhD, Director, Consumer, Sensory and Market Insights at Vineland.

The need

Urban tree plantings play a crucial role in building vibrant green spaces, bringing benefits to the environment, economy and society while offering natural solutions to climate challenges.

Plant growers, municipalities, nurseries and other stakeholders have all been working towards the same goal of urban tree development, just not as a concerted effort.

During its analysis, Vineland's team found there was a common need for all value chain participants wanting to achieve thriving, long-lasting urban tree plantings to promote a more collaborative approach to support the development and implementation of truly innovative and impactful solutions.

What was needed:

- Identify members of the urban tree value chain
- Establish how they work and communicate together
- Define their needs, priorities and challenges
- Develop a model for collaboration between stakeholders





**Tree Establishment
Process Map**

The opportunity

The Consumer, Sensory and Market Insights team initiated its value chain analysis by building an understanding of who was or could be involved and what it takes for a tree planted in an urban Canadian environment to thrive. This meant mapping out every step, every participant and every activity surrounding tree planting in municipal settings while identifying the opportunities and challenges faced by stakeholders along the value chain.

To do so, the Vineland team conducted 20 in-depth interviews with representatives from nine different segments of the value chain: municipality, nursery, consultant, soil supplier, contractor, landscape architect, non-government organization, property developer and conservation authority.

The outcome

Overall, the analysis identified three common themes among all value chain participants that can lead to more successful urban planting outcomes: communication, education and planning.

As well, the team discovered there are two different ways to best understand how young saplings transform into fully grown trees in Canada's urban environments: how plant products are transported, and how knowledge and ideas spread.

"Although municipalities have the knowledge and both growers and soil suppliers also have the knowledge, they don't always talk to each other, so we understood the importance of consultants, contractors and landscape architects in keeping the chain connected. In every case, everybody was in alignment with how plant products move through the supply chain but information about the right plant species to choose and the correct time to plant weren't as clear," adds Bowen.

These two streams were combined to develop the Tree Establishment Process Map (click on QR code above to view) which highlights the members and actions involved in growing, planting and maintaining healthy urban trees. It illustrates the communication pathways that exist and the missing pathways that members felt were beneficial and essential to successful tree establishment.

As a result of the value chain analysis conducted by the Vineland team, a consortium model was identified as the ideal way to address an increased need for communication, training and standardization for the sector.

The impact

Vineland launched in 2021, the Greening the Landscape Research Consortium, a public-private sector collaboration that sets research priorities based on industry needs, address common challenges across industry sectors and find ways to advance the entire urban landscape industry and boost its economic success.

The model developed via Vineland's value chain sector analysis focuses on collaboration and connectivity between value chain members with the goal to increase and improve the flow of communication. The Consortium's activities fall into four pillars:

- Science and innovation
- Collaboration
- Knowledge and mobilization
- Operations and delivery

The Consortium began with 15 members, whose priority areas included soil standards for tree establishment, soil health and root management, tree maintenance during establishment and species selection. By year two, the membership had grown to 22 members and priorities had shifted to climate change, collaboration with other partners and soil health and root management.



... we understood the importance of consultants, contractors and landscape architects in keeping the chain connected."

Vineland worked with initial Consortium members to develop five case study projects for the pilot phase of research and created a monitoring and evaluation plan to benchmark the Consortium's impact and effectiveness.

"Our research has helped create buy-in by all members of the industry making the partnership/consortium/collaboration stronger. It's an approach that can be used across the sector to help understand value chains, their members and how products move through them — but most importantly, it shows people that if we work together, we can solve these issues and be successful," says Bowen.

A member survey conducted in year two showed the level of satisfaction with how the Consortium is performing:

90% of members are satisfied with the level of collaboration

81% feel the Consortium is fulfilling its roles and responsibilities

81% believe the quality of products is aligned with expectations

77% feel the Consortium has enhanced the knowledge, awareness and skills of the urban tree value chain

Looking to the future

A value chain analysis tool is a highly effective mechanism to inform future business decisions by providing research that can be positioned for future success.

Vineland's analysis focused on discovering members along the value chain, such as potential customers, suppliers or other important stakeholders and also the opportunities and challenges that require a business solution.

This critical tool has helped determine the appropriate model required to align the communication and connection needs within the sector and also attained the broader optimization and mobilization of urban tree survivorship knowledge. Vineland's Greening the Landscape Research Consortium has put these goals into action with positive feedback from its membership.

In addition to the value chain analysis tool, the Consumer, Sensory and Market Insights team offers a number of business intelligence services aimed at empowering organizations with future planning needs. These services can de-risk future decision-making by providing industry data and stakeholder feedback to ensure future activities are effective in attaining the desired results.

This research was supported by Agriculture and Agri-Food Canada through the Canadian Agricultural Strategic Priority Program (CASPP).



Searching for solutions against different thrips species affecting Ontario greenhouse crops



Greenhouse growers are constantly looking for new ways to fight pests that affect their crops. And thanks to the work of scientists, they'll be better equipped due to a recent discovery of an unknown and highly detrimental species.

Thrips is a pest that affects a wide range of ornamental crops where it causes damage making the plants unsaleable. It had long been believed that western flower thrips in particular was the culprit but it was Sarah Jandricic, PhD, Floriculture Integrated Pest Management Specialist with the Ontario Ministry of Agriculture, Food & Rural Affairs (OMAFRA) who first demonstrated a second species in the mix: onion thrips.

"We didn't know where it (onion thrips) was coming from — we suspected outside — and it stayed over the winter, causing quite a bit of damage. Regular biocontrols we had developed against western flower thrips also didn't control as well," explains Rose Buitenhuis, PhD, Director, Biological Crop Protection at Vineland. "So, growers still needed to spray, which solved the onion thrips problem but didn't work for the resistant western flower thrips."

This led to a collaborative research project between Buitenhuis, Jandricic and University of Guelph professor Cynthia Scott-Dupree, PhD to find a biological control for both species that could work in greenhouse environments.

A deep dive into the differences between the two thrips species revealed that biological controls could work equally well on both species in the laboratory but not in commercial greenhouse settings. At the same time, a survey of greenhouse ornamental growers confirmed that onion thrips indeed enter greenhouses from the outdoors.



Ashley Summerfield, Senior Research Technician, Biological Crop Protection and Rose Buitenhuis, PhD, Director, Biological Crop Protection.

This caused researchers to wonder whether other horticultural crops could also be affected by the pest and ultimately led to the next phase of research now underway.

"We expanded the survey and our research to greenhouse vegetables as well as greenhouse strawberries and cannabis, and we found that while peppers, cucumbers and strawberries are mostly affected by western flower thrips, one third of the thrips in tomatoes and ornamental crops are onion thrips," Buitenhuis says, adding that OMAFRA Greenhouse Vegetable Integrated Pest Management Specialist Cara McCreary became involved in that second phase of research.

Interestingly, the one cannabis greenhouse sampled was found to be completely affected by onion thrips.

Greenhouse trials using all available biocontrol options are now underway to try and find out why the treatments are successful only in the laboratory and not in large-scale settings. As part of this work,

researchers are testing different biocontrol agents to see how they work on the individual plant level and have found differences in the thrips species' behaviours that might yield some clues.

"They like to be on different parts of the plants or be active at different times of the day," she says. "We still have work to do but it will inform us on how to adjust the choice and application of biocontrol agents to better equip greenhouse operators when dealing with these pests."

The team has also detected a new thrips species in Ontario, *Thrips parvispinus* or pepper thrips, which was first discovered in North America, more specifically in Florida in 2020.

According to Buitenhuis, it's a tropical species found mostly on tropical ornamentals and occasionally on greenhouse peppers, and although Canada's cold outdoor temperatures would kill it, indoor greenhouse environments are warm enough year-round to potentially allow its survival.



Western flower thrips under microscope.



***Thrips parvispinus* under microscope.**



At a glance

- An original project focusing on onion thrips in ornamental crops has expanded to include greenhouse vegetable crops and has led to the discovery of a new thrips species in Ontario.
- Two main species, western flower thrips and onion thrips, are affecting greenhouse vegetable and ornamental crops, while exotic species, like pepper thrips, are a growing concern.
- Current research is looking at identifying differences between thrips species and how those differences can be used to determine which biological controls should be used to best protect crops.
- Educational workshops are now being held to inform growers on best pest management strategies when dealing with thrips species.

The good news is that workshops are now being offered to help growers identify the different thrips species, a key step in selecting the right pest control strategy. According to Buitenhuis, there is no single biocontrol agent that will control all the pests. However, using a combination of various biologicals with resistant varieties, as well as improving biosecurity to keep thrips from entering a facility from the outside or on cuttings, will help.

"Our original project of looking only at onion thrips has snowballed into additional projects, which is really expanding our knowledge and understanding of this pest and how to control it," she says, adding the collaborative approach with OMAFRA and the University of Guelph has also been an invaluable asset.

The Ontario Agri-Food Innovation Alliance is funding the current phase of this research.





New focus on validating and de-risking horticultural technology for growers

Labour-saving technologies and practices have long been a key focus for fruit and vegetable growers. Horticulture is a sector with many delicate, fragile crops that require a lot of hand labour to grow, manage and harvest but growers are also increasingly challenged with both a shortage of workers and rising labour costs.

In 2018, Vineland began to lead the Agriculture and Agri-Food Canada's Canadian Agricultural Partnership Five-year Automation Cluster enabling the development of new technology solutions for the horticultural industry.

A summary evaluation process conducted by Vineland was completed when the program ended in March 2023, which highlighted some interesting lessons learned, notes Darby McGrath, Vineland's Vice President, Research and Development.

Vineland's Brian Lynch, PhD, Director, Horticultural Technology Solutions.



"During this time, the ecosystem had matured considerably. Five years ago, the big push was on technology development and putting North America on the map in terms of horticultural technology and automation," she explains. "Now the focus is on how we ensure the technologies aimed at growers are the right ones and how do we optimize, validate and de-risk those technologies for growers?"

Another realization was that Vineland's role in this space had evolved beyond just automation to include vision systems, sensing, robotics and even the plants themselves as part of a holistic systems approach to innovate in horticultural technologies, she adds.

"This is what led to the name change of our Automation innovation program to Horticultural Technology Solutions and a renewed focus on how Vineland can best support the industry as a result of the cluster and what we've learned from that process," she says. "We've also promoted Brian Lynch to the position of Director of this new innovation program. He's an individual with a strong dedication and passion for industry solutions."

In addition to labour-saving technology, the Vineland team has also spent time looking at how technology can support production efficiencies and help the industry meet new sustainability targets as well as contributing to food security.

That's where Vineland's consumer sensory and plant production expertise combined with its horticultural technology knowledge, can offer a competitive advantage to both technology companies looking to bring solutions to the industry and growers keen to understand the new technologies being placed before them.

"We identified a huge gap around validating new technologies and Vineland has a unique ability to be a well-rounded, third-party evaluator of how these new technologies can operate in the horticultural

Myles Lidka, Mechatronics
Engineer at Vineland.

space,” explains Brian Lynch, PhD, Director of Horticultural Technology Solutions at Vineland.

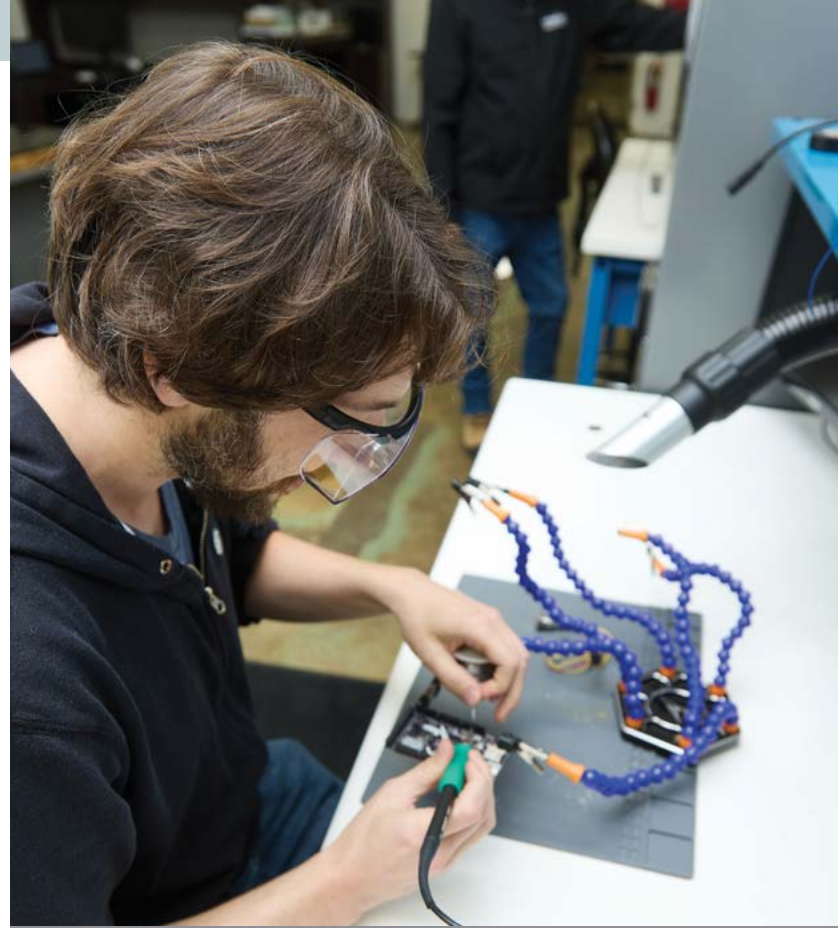
This same approach can help with optimizing new technologies too, where Vineland has the capacity to work with companies, including industries from outside of horticulture and help identify, adapt and integrate technologies that could make fruit, vegetable and ornamental production more efficient or competitive.

A third option is co-development, where Vineland can put its multi-faceted expertise to work with a corporate partner to further the development of an emerging innovation.

A recent example brought Westech Agriculture from Prince Edward Island to Vineland for help in improving a system to count strawberry plantlets. The company is the leading strawberry nursery on the island and specializes in propagating and selling young strawberry plants to fellow growers. Accurate plant counts are key to ensuring their customers receive the right number of plants and are invoiced correctly.

“We used artificial intelligence and our vision system expertise at Vineland to recognize features of the plants’ anatomy so that it could more accurately count plants on the belt even if they overlap one another — and the system is now installed and being optimized for use in their facility,” says Lynch. “We can evaluate technologies in our pre-commercial greenhouse on campus and provide evaluations and recommendations around improvements.”

Longer term, Vineland’s vision for its Horticultural Technology Solutions team is to become a validation hub for the industry and also a gateway for testing and optimizing international technology solutions for the Canadian industry. Many international innovations are based on production systems and data that are different from what is found in Canada, so it can be difficult to know if they’ll be successful here without on the ground validation.



At a glance

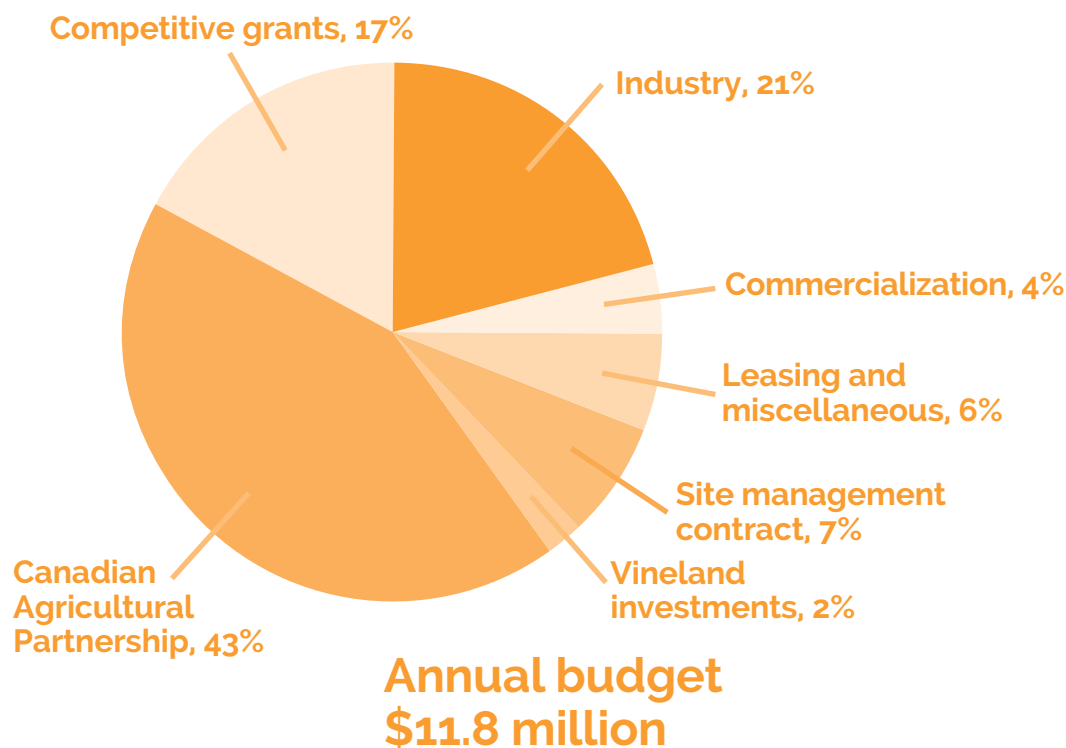
- Over the last five years, the horticultural innovation landscape in North America has evolved from technology development to focusing on how new technologies can be optimized, validated and de-risked for growers.
- Vineland is shifting its focus from automation to more broad-spectrum horticultural technology solutions that encompass vision systems, robotics, sensing and the plants themselves.
- The long-term goal for Vineland is to become a horticultural technology validation and optimization hub serving the Canadian horticultural sector.

“Technology can’t exist separately from living organisms and it needs to be integrated. Vineland’s competitive advantage is that we understand fresh products intimately and thoroughly. The power of what we can do in this space is the nexus between the production environment, technology and understanding the needs of customers,” summarizes Lynch. “We bring that interdisciplinary knowledge that makes Vineland well versed to fulfill this role for the industry.”



Vineland at a glance

Revenue April 1, 2022 – March 31, 2023



Partnerships



238 partners*

206 industry **15** academic

17 government

From

9 Canadian provinces

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

13 countries (Belgium, Canada, Finland, France, Germany, India, Israel, New Zealand, Spain, Switzerland, The Netherlands, United Kingdom, United States)

*For fiscal year 2022-2023

Commercialization

- 5** Vineland developed technologies with patents issued/filed
- 34** plant varieties with Plant Variety Protection issued/filed
- 13** trademarks registered/filed
- 82** per cent of Vineland's protected IP is commercialized or under further collaborative R&D with business partners

Research capacity and performance*

18 research scientists

\$277,000 research intensity
(research revenue generated per researcher)*

\$22,500 innovation strength
(royalties generated per researcher)*

73% proposal success rate*

*For fiscal year 2022-23

Vineland's new state-of-the-art innovation space

Vineland's recently restored and renamed Jordan Building provides a centralized laboratory and office space for Vineland's Plant Responses and the Environment team to develop resilient and sustainable best practices for natural landscapes in horticulture.

This unique facility adds a number of advanced capabilities including a climate-controlled laboratory space, a dedicated root washing room, localized venting and specialized fume hoods to allow for soil processing in a centralized location. With two state-of-the-art laboratories, the Jordan Building is designed to handle the analysis of soils and substrates for all types of horticultural production needs.

From crop and natural infrastructure, to soil health and growth parameters, this new facility will significantly enhance Vineland's research and innovation capabilities allowing for investigative and production trialing in a controlled environment.

Vineland's 218-acre campus is maintained by the Agricultural Research Institute of Ontario (ARIO).



May Chang, Board Chair



Karen Belaire, Past Chair

Vineland's Board of Directors (2023-24)

- May Chang, Board Chair
- Tony DiGiovanni, Board Vice Chair
- Karen Belaire, Past Chair
- Kristin Ego MacPhail
- John Groenewegen, PhD
- Lori Hall
- Fred Koornneef
- Rick Mastronardi
- Mark Picone
- Ian Potter, PhD, Vineland President and CEO
- Ray Price
- Liz Stokes Bajcar

Job creation, education and training*

81 full-time staff

49 highly qualified positions

1 PhD student

*For fiscal year 2022-23

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.

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Sustainable Canadian
Agricultural Partnership

Ontario



Canada 