Impact

Innovate for impact

As Vineland Research and Innovation Centre approaches its tenth anniversary, it's the right time to talk about progress.

In 2007, Vineland was a new concept, an independent research organization set up with a focus on creating impact for the Canadian horticulture sector. Impact in this context means acres in the field, shelf space in the grocery store. It means profitable farms and greenhouses, exports, new businesses, jobs and environmental gains.

With $5.3 billion in farm gate sales alone, the economic importance of the Canadian horticulture industry is remarkable. It also brings us the fruits, vegetables, flowers and plants essential to a healthy and vibrant lifestyle. In a global marketplace, we need to ensure the Canadian horticulture sector remains prosperous and sustainable to safeguard this lifestyle for generations to come. Innovation can help do that.

Today Vineland's most obvious achievement has been rebuilding the centre into a thriving hub of horticultural research. Almost 100 full-time staff have been added, abandoned laboratories have been renovated and outfitted with the latest scientific equipment and our new pre-commercial greenhouse is full to capacity. This in itself is good news for the horticulture sector but what we are most excited about is the impact Vineland's work is generating. Horticultural research timelines can be long and commercialization challenging. As we have grown, we have refined our approach and developed innovative processes to keep the impact of our research and innovation front and centre. The effort and the investment are beginning to pay off.

vineland
RESEARCH & INNOVATION CENTRE

When you see this icon, click for additional related content.

Case Study

Cold Snap™ pear – Winter's Favourite Fruit™

Background

The average Canadian consumes almost five pounds of pears every year. However, we now import more pears than we grow and currently, on average, only 10 per cent of pears consumed in Canada are grown locally.

In 2015, more than 78,000 metric tonnes of fresh pears (valued at $120 million) were imported into Canada. Most of the pears came from the U.S. (54 per cent). This wasn't always the case. Pear production in Canada was thriving until the 1980s when it started to decline due to a number of factors including disease, conversion of farm land to housing and the increasing cost of labour. The collapse of the pear processing industry in 2008 further exacerbated the situation.

About Cold Snap™

The Cold Snap™ pear was developed by plant breeders at Agriculture and Agri-Food Canada (AAFC) over decades of crosses and selections. In 2009, AAFC licensed the Cold Snap™ pear to Vineland for global commercialization and a new business model with benefits for both growers and consumers was developed.

The Cold Snap™ pear features:

- Wide consumer appeal
- Fire blight tolerance
- Large fruit size
- Superior postharvest storage life
- Winter hardiness

Commercializing the pear

Vineland's approach was to bring this pear to market in Canada as a premium *club variety* providing the marketer with the competitive advantage needed for differentiation and building value. This approach works for other fruit varieties including apples and tomatoes by enabling the variety manager to achieve a premium price, ultimately benefiting everyone along the value chain.

The Vineland Growers Co-operative (Co-op), the largest packer and distributor of pears in Canada, was selected as the exclusive licensee for the commercialization of Cold Snap™ in Canada.

Protecting intellectual property

New plant varieties are typically protected by Plant Breeders' Rights (PBR) to ensure propagation and distribution can be managed effectively. Vineland manages PBR for the pear on behalf of the Co-op and took the additional step of obtaining multiple trademarks for the Cold Snap™ name, logo and tagline to give Canadian growers a competitive advantage over imports. This trademark protection ensures licensed growers within Canada can market the pear under the Cold Snap™ name and unauthorized imports won't impact our markets.

Incentivizing the shift to high-density orchards

In 2011, prior to the first Cold Snap™ plantings, Canadian pear orchards were traditionally spaced at a density of 200 to 300 trees/acre. Elsewhere in the world, apple and pear growers had shifted to new high-density planting methods, providing higher yields and earlier harvests. Canadian growers were hesitant about the upfront investment needed to plant 1,000 trees/acre and install extensive post and wire infrastructure, especially when facing a local pear industry in decline.

To encourage growers to adopt high-density production, royalty payments were structured to create incentive. Production royalties were charged on a per acre basis rather than the usual percentage of fruit sales. The rapid maturing, higher-yielding, high-density orchards would therefore provide a clear advantage over traditional low-density plantings. The fire blight tolerance of the pear was an additional incentive for growers, effectively de-risking investment in new plantings and reducing the cost of controlling disease. As a result, almost 100 per cent of all Cold Snap™ trees have been planted in high-density orchards.

The opportunity presented with the Cold Snap™ pear helped growers expedite the shift to high-density production and the practice is spreading with other fire blight-tolerant pear varieties being planted using high-density production.

Consumer insights

The club branding approach to commercialization requires an identifiable brand supported with a strong marketing campaign. For this, the Co-op sought research guidance from Vineland for insights to identify consumer appeal. This research was critical for Kitestring, a creative branding studio, who used the findings to define the Cold Snap™ brand and story. Throughout the brand development process, Vineland worked with Kitestring to test consumer reaction and validate various elements of the marketing plan.

With its distinctive bright blue packaging, the Cold Snap™ pear was officially introduced at the Royal Agricultural Winter Fair and welcomed in grocery stores across Ontario during the late fall of 2015 and early winter months of 2016. Using Vineland's consumer data, the Co-op leveraged the brand story to price the Cold Snap™ pear at a premium in the marketplace.

Consumer insights define the Cold Snap™ brand

- Sweet and flavourful
- Juicier and less grainy than other pears
- Made-in-Canada, produced locally
- Naturally disease-resistant meaning less pesticides
- Longer lasting with firm texture even when fully ripe

Impact

The introduction of the Cold Snap™ pear creates economic impact for multiple players across the horticulture value chain, including nurseries supplying trees and consumers purchasing the fruit. The greatest impact, however, is for growers and marketers of the fruit.

To quantify impact, Vineland assumed the variety will have a lifetime of 14-15 years, after which plantings of Cold Snap™ will taper off as other pear varieties enter the market. The numbers presented throughout this case study are calculated based on the first four years of tree sales data and projected over a 14-year period and discounted to 2015 dollars. However, once planted, individual orchards will likely yield fruit for as long as 40 years.

Propagators

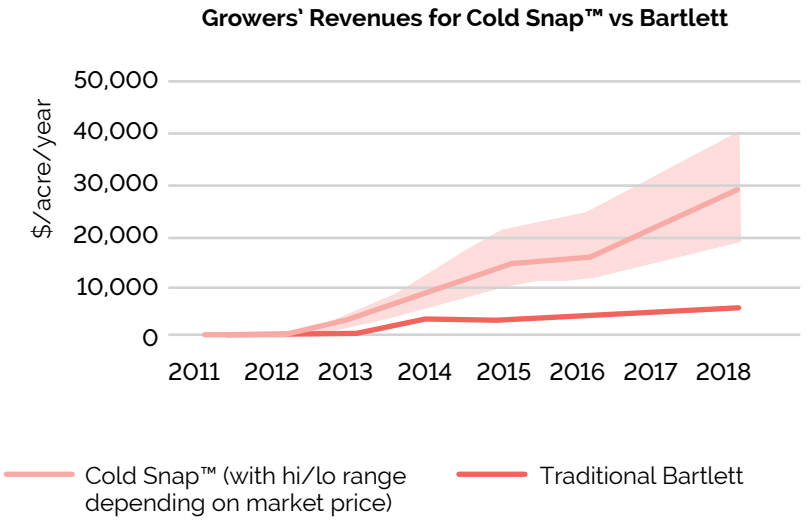
The interest from growers in an exclusive, branded pear variety created an exceptional demand for trees with sales reaching a peak of nearly 28,000 trees/year within four years. This uptake is much higher than for traditional open release varieties which tend to scale more slowly and peak at around 5,000 trees/year.

In addition to the rapid scale-up, it is clear high-density planting sells more trees and propagators benefit significantly when growers plant Cold Snap™. Based on projected acreage being planted and assuming an average tree price of $12, sales of Cold Snap™ will generate a present value of $1.3 million in revenue for propagators, which is $1 million more when compared to standard Bartlett pear orchards planted on the same acreage.

The Co-op and its growers

The high-density plantings, coupled with premium pricing, will generate significantly higher benefits to growers when compared to traditional plantings of Bartlett.

At a premium wholesale price of $1.11/lb, the net present value of all production when moving from a standard pear like Bartlett to Cold Snap™ generates $51.5 million which will accrue to both the Co-op (as the exclusive marketer) and its growers.



Cold Snap™: a grower-friendly pear

- Fire blight tolerance dramatically reduces the risk for growers when shifting to high-density production which produces higher yields per acre, accelerates the time to first harvest and allows more sunlight to create the pear's desired blush
- The fruit stores extremely well, maintaining quality throughout the winter
- The large fruit size means the majority of pears can be sold into the high value fresh market category
- The fruit hangs well and is easy to harvest
- The fruit is harvested late in the season which helps farm labour scheduling
- Fire blight tolerance reduces need for spraying

"Cold Snap™ has everything going for it- it's fire blight-tolerant, which is a huge plus, it's easily trained for higher density, the late harvest helps with farm labour organization and the pear also hangs well. It really is a grower-friendly pear."

John M. Fedorkow - Fruithaven Farms

"Cold Snap™ is especially appealing because of the later harvest, eating quality and exceptional storability. While typically pears can be stored until November/ Christmas, Cold Snap™ can be stored well throughout the winter, giving the market access to local pears for most of the year. Breeding should continue for these type of pears, there is definitely a future in that."

Jamie Warner – Warner Orchards

International growers and marketers

The appeal of the Cold Snap™ pear variety extends beyond Canada, particularly due to its fire blight tolerance. Interest from international partners has led to the variety being licensed for production in the U.S., Europe, Northern Africa and other regions. To retain a competitive advantage for Canadian growers, Vineland has developed licence agreements and trademark protection to prevent trees and pears from being sold back into Canada. International plantings will generate significant royalties to support ongoing research at Vineland with benefits flowing back to the Canadian industry.

Reinvesting in research

The royalty structure for the Cold Snap™ licence in Canada sees $1.50 for every tree sold returned to Vineland. After five years, when the orchard has reached maturity, a charge of $225/acre will be levied. Based on projected plantings, the present value of these royalties over the 14-year period is estimated at $1.3 million for reinvestment in research to further support horticulture innovation.

Retail and consumers

The late season harvest and enhanced storability of the pear create an opportunity to put local pears on grocery store shelves throughout the winter. This advantage, in combination with the branding strategy, allowed grocery stores to position Cold Snap™ as a premium product, selling 90,000 pounds of pears in the launch year, pre-packaged and branded in two-pound bags. Building on this strategy, marketable yields are expected to increase substantially to generate sales to almost two million pounds by 2018 and four million pounds by 2024.

Success at a glance

Success is the result of a multi-faceted collaboration between many organizations and a broad base of growers who embraced a new business model delivering benefits to growers and consumers. The Cold Snap™ pear is rejuvenating the pear industry in Canada with production continuing to scale-up, ensuring more pears reach the market in the coming years.

- Cold Snap™ can be stored for longer and sold throughout the winter, meaning consumers have access to fresh Canadian pears
- Cold Snap™ is fire blight-tolerant, reducing the need for spraying and allowing growers to shift to high-density orchard production
- Vineland has commercialized the pear using a club branding approach including exclusive licensing, consumer-informed marketing and trademark protection
- Sales of Cold Snap™ trees escalated rapidly to a peak of almost 28,000 trees per year and will generate a present value of $1.3 million in revenue for propagators, $1 million more than if standard Bartlett pear orchards were planted on the same acreage
- Cold Snap™ will create a net benefit to growers of $51.5 million
- Canadian and international sales of Cold Snap™ will generate royalties of $1.3 million over 14 years to support ongoing research at Vineland

Case Study

Environmentally friendly options to control destructive flower pest

Background

Flowers are big business in Canada. The industry is worth more than $1.1 billion with 1,900 growers employing 20,000 people. More than half of the industry is in Ontario, growing everything from roses and chrysanthemums to gerberas and impatiens.

The biggest threat to this big industry is a tiny, destructive insect called the western flower thrips, which has also become resistant to most chemical means of control.

In an effort to help growers reduce crop losses and improve the quality of their flowers, scientists at Vineland took on the challenge of finding efficient and cost-effective biological ways to contain the pest.

Research that began in 2010 has produced encouraging results, making Vineland a global leader in developing effective biocontrol strategies.

Challenge

The western flower thrips pierce the plant's surface and suck out the contents of leaves and petals, causing unsightly white or brown spots, streaks and scars. One of its effects includes stunting the proper development of buds. Thrips also carry viruses that may further damage the plant material, making the flower or plant unmarketable in an industry focused on aesthetics and zero tolerance for damage.

"If you can't control thrips you might as well stop growing flowers in greenhouses in Ontario. The thrips biocontrol program at Vineland had a quick turnaround from the start in 2010 and always provided information that was needed by the growers. So far it has been the most beneficial program for us out of Vineland."

Jamie Aalbers, Research Director, Flowers Canada Growers

Since chemicals don't work effectively on thrips, biocontrol agents, or natural enemies like mites, bugs, nematodes (roundworms) and fungus - by themselves or in combination - were turned to as an alternative. But there was little data or direction for growers.

Getting answers

Flowers Canada Growers, an industry association, provided initial funding for Vineland to discover and test strategies using different biocontrol agents. The goal was to develop and deliver reliable, cost-effective biocontrol programs for growers.

Vineland scientists found that biocontrol strategies need to be carefully planned and customized to the plant. By definition, biocontrols are living organisms, so they, too, have to be kept alive and healthy in order to do their job.

Seeing real improvements in crop health takes more time with biocontrols than with traditional chemical treatments. While they can be initially expensive, complicated and time-consuming, researchers found that, when properly used, biocontrols are also effective, environmentally friendly and can, eventually, reduce pest control costs.

Impact

The time, resources and effort put into research on biocontrols against thrips is yielding results on multiple fronts.

Effective strategy

Recommendations developed by Vineland researchers enable growers to use biocontrols as part of a well-planned strategy for containing thrips. More than 70 per cent of growers surveyed agreed that they would change their practices to follow Vineland's recommendations.

Information in one place

Previously, biocontrol research results were provided to the industry on a project-by-project basis, which meant that resources were narrowly focused and not widely available.

Now, information on thrips biocontrol best practices is shared with growers and industry representatives in Canada and the U.S.

A comprehensive website called greenhouseipm.org has been developed and is updated regularly. It has a wealth of advice on how to identify and manage pest populations - including thrips – through the use of biocontrols.

Wider set of tools available

Vineland's research data has been used by companies such as Novozymes, Plant Products, Koppert, Bioworks, Biobest, and Syngenta to support the refinement, commercialization and labeling of biopesticides and other biocontrols. Label expansion is critical for the industry to enable growers to access the products they need and greater adoption of biocontrol means more sales for these companies.

Healthier for staff

Biocontrols require less protective equipment and fewer safety precautions for employees as compared to general-use chemical pesticides.

Consumer uptake

With more consumers becoming sensitive to how their purchases affect the environment, there's a growing demand for chemical-free flowers and plants. Growers using biocontrols on flowers and plants can take advantage of this trend.

> ***"The thrips biocontrol program at Vineland has been exceptionally helpful to Canadian greenhouse flower growers. Vineland is an integral part of the biocontrol team in Ontario. Without it, growers, suppliers and OMAFRA (Ontario Ministry of Agriculture, Food and Rural Affairs) could not work successfully in this area."***
>
> ***- Lou Schenck, Schenck Farms and Greenhouses***

More than 70 per cent of growers surveyed will change their practices to follow Vineland's recommendations

Case Study

Canadian apple industry Smitten™ with new, promising variety

Challenge

In the face of increasing competition from popular, high value, high-quality imported apples, Canadian apple growers are looking to diversify and upgrade their variety selection. New varieties must meet changing consumer preferences for appearance, taste, freshness and shelf life as well as handle ever-changing pest, disease and climate conditions. But new tree fruit varieties typically take more than 15 years to develop from initial research to commercial production. One way to fast-track a solution is to bring in already-finished varieties from around the world.

Scouting the world

Vineland's technology scout regularly scours the world for new varieties and technologies that will benefit the Canadian horticulture industry.

Identifying a new apple variety developed in New Zealand that looks and tastes delicious, stands up well to handling and storage, and commands a premium price, looked like a winner. Vineland acted quickly, using an extensive industry network, to make sure Canadian apple growers could take advantage of the opportunity.

Through its network, including the Associated International Group of Nurseries and Prevar (commercialization agent for New Zealand Institute for Plant & Food Research), Vineland brought the apple into Canada and in 2013 launched a multi-site testing program with industry grower partners to make sure Smitten™ would do well in Canadian conditions. Vineland then brokered licensing deals between Pegasus Premier Fruit, the Washington-based company that holds the North American marketing rights to the variety and interested Canadian growers and marketers.

- **The Smitten™ premium apple generates at least 20 per cent higher returns than a standard variety like Royal Gala**
- **Three Canadian growers have licensed the Smitten™ variety and will plant 200,000 trees by 2020**
- **Canadian Smitten™ orchards will generate almost $116 million in apple sales for the first 14 years**

In bringing this new variety to Canada, Vineland's business development team approached all grower-marketer operations known to be equipped with the production, packing, marketing and distribution capabilities identified by Pegasus as critical to the variety's success. In 2015, three partnerships were cemented.

Impact

Facilitated by Vineland, three Canadian apple producers/marketers are expected to plant 200,000 trees, or about 200 acres of the variety by 2020.

The Smitten™ brand apple is established as a premium variety in other markets and apples are expected to sell for between $44 and $63 for a 40-pound box at the farm gate. That means they will generate $1.10 to $1.58 per pound (gross) on average for growers - compared to $0.90 per pound for Royal Gala, a standard variety grown in Canada.

Assuming a price premium relative to other varieties, the farm gate value of Smitten™ apples is projected to be $90,720/acre for a marketable yield of approximately 38 metric tonnes/acre when the orchard reaches maturity.

This would translate to gross sales revenue in the first 14 years for 200 acres planted by 2020 of $115.8 million ($2016) or a gross sales value of $10.2 million per year. Vineland's minimal initial investment to get test trees in the ground will ultimately generate millions of dollars of return for Canadian apple growers.

Case Study

Red, red wine: Vineland develops sophisticated Appassimento technology to meet winemaker's needs and consumer preferences

Background

Canadians love their wine - especially the reds. The volume of wine sold in Canada increased by 40 per cent between 2004 and 2013 with more than half of that imported reds.

Challenge

Canada's cool climate and short growing season mean it is difficult to consistently grow the high-quality grapes needed for premium red wines.

Some winemakers began to experiment with the Italian Appassimento method of drying grapes, which concentrates the fruit's sugars and produces a bold, high alcohol red wine. They experimented with on-the-vine drying, laying grapes out to dry in greenhouses or barns and using former tobacco kilns. But the inability to control humidity, temperature and pests meant significant crop losses.

Getting answers

In 2011, Ontario's Rennie Estate Winery and Kew Vineyards approached Vineland to develop a technology that would give them better control over the drying method.

Vineland researchers developed a novel technology for a forced-air grape drying process over which winemakers have much better control. It is flexible and can be adjusted according to different harvest conditions and winery requirements.

The technology was tested in 2012 against all other drying methods by Brock University's Cool Climate Oenology and Viticulture Institute, and came out on top.

In 2013, Vineland filed patent applications (U.S. and Canada) on the air flow technology which have now been accepted and in 2014 issued a call for proposals to identify a commercialization partner. MTX Postharvest was the successful applicant who licensed the technology and produced the first prototype self-contained, Appassimento chamber which was installed at Kew Vineyards.

Impact

As a result of the new Appassimento technology, Kew Vineyards increased production of its Soldier's Grant blend from 300 cases in 2011 to 1,000 cases in 2014. Kew's full Appassimento wine, Heritage, is the winery's top seller.

Blending with Appassimento wines can increase the flavour profile and value of table wines. Depending on the grape, blending can add 40 to 70 per cent to the price of a bottle. John Young, owner of Kew Vineyards, reports that blending with Appassimento creates a higher quality wine that can be sold for $4 more per bottle than the standard variety.

Kew Vineyards invested in the first prototype unit and MTX has now sold a second to Rennie Estate Winery which was installed before the 2016 grape harvest. The $70,000 unit cost may seem substantial but the higher quality wines created mean a payback of less than three years.

Wines crafted using this technology have won national awards, and in 2014, the Ontario Wine Awards introduced a new category for Appassimento wines. Rennie Estate Winery's 'G' wine took home the gold.

- **Vineland's patented technology controls the drying process to eliminate losses that occur with other drying methods**
- **Blending with Appassimento wines can improve the flavour profile and add 40-70 per cent to the price of a bottle**
- **10 Ontario wineries have contracted Vineland to participate in commercial-scale trials of the drying technology**
- **Within one year of market launch, two stand-alone drying units were sold and are currently in use for commercial wine production**

"At the end of the day it really comes down to the consumer. If you can produce a high-quality product at a reasonable price, then the consumer will be very supportive. I think we were able to do exactly that with our Soldier's Grant wine, which was produced with the help of the Vineland Research and Innovation Centre's Appassimento technology."

- John W. Young, Kew Vineyards

"We are currently working with the postharvest research team at Vineland to adapt the Appassimento drying technology to our winemaking needs because we see that there is a great future in this."

- Andrzej Lipinski, Big Head Wines

Case Study

Pixie™ grape's impact anything but miniature

Background

The Pixie™ grape is an 18-inch tall miniature version of the Pinot meunier variety with tiny clusters of red-skinned grapes. It was initially used for grape breeding research but Sunrise Greenhouses Ltd. (Sunrise) saw its potential for the ornamental market.

Commercializing Pixie™ grape

After Pixie's potential as an ornamental was identified, Sunrise contracted Vineland's consumer insights team to validate the concept and help define the product's packaging and price point. Sunrise licensed Pixie™ grape from Vineland for global commercialization and began propagating for commercial launch in 2011.

To protect the grape's North American market position, Vineland filed for Plant Breeders' Rights (PBR), U.S. plant patents and trademark protection. Vineland also worked with the Canadian Food Inspection Agency (CFIA) to establish a Pixie™ grape certification process. Vineland's business development team also supported Sunrise's international commercialization efforts by identifying potential sub-licensees and drafting legal agreements.

Pixie™ was officially released in 2012 at Canada Blooms, Canada's largest home and garden show. In 2013, Sunrise signed an exclusive deal with Loblaw who featured Pixie™ in the PC Insiders Report and sold nearly 40,000 plants through grocery stores and garden centres across Canada.

Growing the Market

Recognizing its novelty value, Vineland expanded the Pixie™ product line by crossing the plant with other wine grape varieties to produce a suite of miniatures with a range of plant structures, leaf shapes and grape colours. Consumer testing identified the most appealing candidates and four were selected for commercialization and plant variety protection.

Meanwhile, Sunrise set its sights on the export market, negotiating distribution deals for the U.S., Japan and Europe and shepherding Pixie™ through a myriad of quarantine and regulatory hurdles.

Impact

By 2014 Pixie™ grape was available at supermarkets and garden centres Canada-wide and in the U.S. with total sales of more than 96,000 plants by the end of 2015.

Despite its small size, Pixie™ has been a success for Sunrise, generating increased sales and supporting business growth through the addition of two new full-time staff. The next generation of Pixie™ products are being propagated and scaled-up with distribution channels into more lucrative export markets.

Pixie™ is now in Japan with commercial-scale propagation happening and first sales expected in 2017. Europe is following closely behind with the first sales expected in 2018. Negotiations are underway to bring the product to other territories.

Revenues to Vineland from the Pixie™ program to date total more than $60,000 reinvested in horticulture research.

Case study

New method for storing Sovereign Coronation grapes cuts costs, increases income for growers

Background

Eating fresh, local Ontario grapes is a treat that could only be enjoyed for a short time every year - until recently. The Sovereign Coronation variety is the grape of choice for many growers since it can withstand the province's cold weather, but the quality of the fruit deteriorates quickly after harvest.

More than 100 Ontario growers with over 770 acres of vineyards produce 82 per cent of all the table grapes grown in Canada.

Challenge

Sovereign Coronation is the main variety of fresh market grapes grown in Ontario. They are blue-skinned and seedless and were introduced to the province in 2000.

Traditionally they could be stored for only about two weeks before mold and brown spots rendered more than six per cent of grape yield unmarketable per year. The grapes were also getting crowded out of the market by other fruits available at this time of the year, resulting in significant income losses for growers.

Getting answers

Researchers at Vineland were asked to find ways to extend the storage life of these grapes to decrease growers' losses, maintain the value of their crops and reduce food waste.

In other countries, pads infused with sulphur dioxide (SO_2) are placed in the storage container to maintain grape freshness.

After trying different concentrations of SO_2 and evaluating the pads' effectiveness after three, five and seven weeks of storage, researchers determined the best treatment: a dual release pad that sends out a high concentration of SO_2 in the first 24 hours, and then a slower rate of release over many days. Using these pads, along with careful handling during the harvest, removal of decayed and damaged fruit, and quick cooling of fruit following harvest resulted in grapes that stayed fresh and marketable for five weeks. That's more than twice as long as previously possible.

Impact

Growers who use this storage technology can sell their crops at optimal quality and price. Storing grapes longer also means selling into the early-winter season when other local fresh products are not available.

The enhanced storability also means less waste. In Ontario this will translate to an estimated 103 tons of grapes that are saved from the food waste stream, helping growers to realize an extra $145,000 in net returns each season. After hearing of Vineland's research results, ProduceTech, a packaging company based in Quebec became the Canadian distributor of sulphur pads for Ontario's grape growers.

- **A new storage protocol has more than doubled the storability of Sovereign Coronation grapes allowing freshness to be maintained for five weeks**
- **A Canadian company is now a licensed distributor of sulphur pads for Ontario's grape growers**
- **103 tons of grapes are being diverted from the food waste stream**

On the road to impact

Deep variant scanning, Vineland's proprietary approach to trait discovery

Background

Plant breeding is big business. Whether conducted by public or private sector breeders, the long timelines, large plant population sizes and advanced technologies require major investment that may eventually be rewarded if and when a new variety becomes a commercial success.

Vineland has embarked on several breeding programs in horticultural crops. In a number of them, researchers have focused on a reverse genetics approach that identifies valuable new plant traits by starting with the gene sequence information and following it through to the whole crop level.

The technology

In adopting this reverse genetics approach, Vineland researchers have developed a platform technology for creating new traits in a variety of important crops. The platform consists of two parts:

- Large populations of plant variants for species such as petunia, tomato, pepper, and cucumber.

- The Deep Variant Scanning (DVS) method which uses high-throughput genomics technologies and bioinformatics to uncover individual variants in large populations. The DVS technology can be applied to Vineland's own or any other variant population of plants.

The DVS technology is a unique approach that gives Vineland freedom to operate in a complex research landscape filled with intellectual property barriers. Two patents have been issued to Vineland protecting this position in Canada, with others pending to broaden the reach internationally.

What is the impact so far?

Vineland is using the platform technology in-house to develop new tomato and pepper varieties with traits such as disease resistance and enhanced flavour. While results are still a few years away, this unique resource has attracted the attention of major seed companies and researchers from around the world.

In the past two years, Vineland has undertaken six contracts with other plant breeding organizations to use this technology. Plant breeders see enormous value in Vineland's high-quality plant variant populations and many of them, even those within large private companies, do not have the capacity to implement sophisticated genomics approaches such as DVS.

Clients include three major European vegetable seed companies, Sevita, a Canadian soybean company and the University of California Davis. These contracts have established important research collaborations and generated a total of $182,000 in revenue for Vineland so far. The work has also allowed Vineland`s researchers to hone their skills, generate new discoveries and expand the reach of this technology.

On the road to impact

Roots of sustainability: greening the landscape

Background

The environmental benefits of trees are many and varied. Trees improve the air quality and can offset carbon emissions. They cool the environment, create habitats for birds and animals and green spaces for our urban lifestyle.

In some areas, including Southern Ontario, more than 80 per cent of the natural forest has been lost due to urban development. The remaining forest has become fragmented into small, isolated patches, reducing biodiversity and the overall resilience of the ecosystem.

Large investments have been made in planting programs to restore developed lands and increase the urban forest. However, more than 50 per cent of trees planted in unmaintained urban settings die before they reach maturity.

The project

Greening the Canadian Landscape is one of Vineland's flagship projects which initially focused on increasing the survival of trees planted along highways and interchanges. Early results quickly identified the importance of soil composition and the need for remediation strategies to encourage healthy root growth.

The project is now a cross-Canada multi-partner initiative engaging the nursery production industry, landscape services as well as several municipalities, government ministries and tree planting organizations that are ready to implement the recommendations as soon as they are developed. The results of research conducted at sites across Ontario and Alberta are being compiled to create a number of user-friendly resources for these partners.

What is the impact so far?

Research has enabled Vineland to define a set of planting specifications that significantly improve tree establishment by creating a 37 per cent increase in growth in the critical two-year period after planting. These specifications have been officially adopted by the Ontario Ministry of Transportation for trees planted alongside Ontario highways.

The *Highway of Heroes* planting project is one example where 117,000 trees are being planted along Ontario's Highway 401 following Vineland's recommendations for site preparation. This one planting program will create $5 million in gross sales for the nursery sector and $10.5 million in landscape services revenue. With the greater likelihood of surviving to maturity, the environmental benefits of these trees will be maximized. Through this project, Vineland has also created relationships along the supply chain to connect Canadian growers with large-scale buyers in the public sector. This means more Canadian trees are going into Canadian landscapes and displacing imported trees. The establishment of local supply chains adds to the survivability of trees and the success of landscape installations because the trees are better adapted to the local climate.

Improving tree survival generates environmental and socioeconomic gains. Local nurseries are selling more trees to large-scale buyers such as municipalities and developers who will be more successful with plantings and save money on landscaping and maintenance costs. More successful plantings mean more mature trees in the urban landscape, improved air quality, increased shading and enhanced public green spaces.

Over the next few years, Vineland will be collecting additional data to develop a comprehensive set of recommendations that will flow through project partners to broaden the reach of this research and contribute to a greener landscape.

- **New planting specifications generate 37 per cent more growth in the critical two-year period after planting**
- **The *Highway of Heroes* is using Vineland's specifications to plant 117,000 trees along Ontario's Highway 401**

On the road to impact

Bringing world crops to market

Background

Changing demographics in Canada presented the perfect opportunity for Vineland and collaborators to explore the production of locally-grown world crops.

While the opportunity was intriguing and growers showed interest in the early years of the program, building a business case that gave growers the full confidence to take this on proved more complex. Limited experience, risk aversion and lack of agronomic and economic data were all identified as key reasons for the reluctance to fully embrace the opportunity.

With this in mind, Vineland began recruiting growers to participate in trials testing new hybrid varieties that might be successful in Canada. The world crops portfolio focused on okra, Chinese long and Indian round eggplant with 22 growers in British Columbia, Manitoba, Ontario, Quebec and Nova Scotia jumping at this on-farm opportunity. At Vineland's research farm, trials on fertility management, grafting and direct seeding got underway along with a trial to move eggplant production into the greenhouse.

Right place, right time

Inderjit Sandhu from Oliver, British Columbia was intrigued by the opportunity and already growing Italian eggplant when he met with Vineland researchers at cross-Canada grower meetings facilitated by Loblaw Companies.

Encouraged by the retailer and supported by Vineland, Inderjit said "the picture became very clear to me" and he started with a four-acre trial in 2015. "In the first year I was shipping my product to Loblaw and growing my business."

"Working with Vineland made the difference because of their support. Their advice was so important to me because I could quickly get a quality product to market," said Inderjit.

"This year I'm also growing okra and planning for Cravo and plastic house production. This is a good opportunity and I would not have jumped so quickly without the ongoing support I got from Vineland."

The project

Feeding Diversity is a flagship program for Vineland given its unique impact across the horticulture value chain. It embraces Vineland's acres in the field, shelf space in the grocery store research and innovation model and works to build the relationships necessary, often from the ground up, to embrace risk and reward for the industry.

The project has accomplished a number of firsts using a multi-stakeholder approach including:

- Identification of a growing opportunity with Canada's rapidly changing demographics
- Selection of hybrids suitable for Canadian growing conditions (shorter season, cooler temperatures) and greenhouse production
- Development of a production knowledge base for grower success focused on agronomic and economic data
- Engagement of retailers including Canada's largest grocery chain
- Support for a cross-Canada network of entrepreneurial growers and the locally-grown movement
- Fresh, local options for Canadian consumers now available at major grocery chains

What is the impact so far?

Field and greenhouse research work will continue through 2018 although initial impact is already evident with new growers coming on-stream and acreage in British Columbia, Ontario and Quebec increasing to more than 100 acres in 2016.

Research has enabled Vineland to continue building a knowledge base and establish grower confidence around hybrid varieties, fertility management, spacing, grafting for field production, direct seeding and season extension.

To further support the business case for growing world crops, Vineland is assembling financial information and tools supporting cost-of-production, cash flow overview and break-even point evaluations.

Ultimately, replacing imports with locally-grown varieties and increasing growers' competitive position is the name-of-the-game.

On the road to impact

Opening new markets for hardy landscape roses

Background

In partnership with the Canadian Nursery Landscape Association (CNLA), Vineland manages Canada's only national rose breeding program focused on cold hardy, low maintenance roses that are strongly aligned with consumer preferences. Program strengths include a consumer-targeted approach, a large collection of unique material, use of advanced breeding technologies and strong partnerships within the industry.

The project

Vineland leads the breeding, development and marketing of new rose varieties, building on core strengths including consumer insights, genomics and business development to bring a fresh perspective to the marketing of landscape roses.

Extensive consumer research including branding concepts has been undertaken to position the rose collection in the marketplace and generate renewed interest in landscape roses with new and younger Canadians. The branding has been designed to celebrate the collective sense of Canada's natural beauty while emphasizing the made-in-Canada story for resonance around the world.

The goal is to reinvigorate the landscape rose market in North America with high-quality plants and create a market into cold hardy regions of Europe. Using a creative and cohesive business strategy, the roses will be promoted as a collection creating a new marketplace for robust landscape plants. The first rose for release from the program in 2017 is the Canadian Shield™, part of Vineland's 49th Parallel Collection.


vineland's
Canadian Shield™
49th Parallel Collection
CELEBRATING CANADA'S 150th BIRTHDAY
Impact | VINELAND

Vineland will manage the commercialization of the collection in Canada through direct licences with propagators, growers and wholesalers. All licensees are encouraged to ensure the branding and marketing elements of the rose collection are maintained for a consistent look-and-feel across the value chain. In other regions including the U.S. and Europe, Vineland will manage intellectual property rights and rely on partners for propagation, sales and distribution.

What is the impact so far?

The Canadian Shield™ launch is a pilot project to validate Vineland's assumptions around value chain, marketing and branding research. Market response and grower feedback will inform subsequent releases that will come to be known as the Vineland collection.

Impact to date also extends across Canada with more than 20 licensees representing all key regions with a commitment to using Vineland's model in marketing including the cohesive brand elements and storytelling. In year one, a limited number of roses will be available and are expected to be coveted given the relationship between the rose and Canada's 150th birthday. Propagators, growers/wholesalers and retailers are expected to benefit from this reinvigorated landscape rose market.

Vineland's breeding program has created a multitude of new material for a pipeline that will see the first new variety launched in 2018. In the meantime, CNLA has provided Vineland with the Canadian Shield™, launching in 2017.

Our process is real-world progress

This report profiles the outcomes and impact of several research projects from Vineland's portfolio. The projects were selected to illustrate some of our first success stories from across the Canadian horticulture sector.

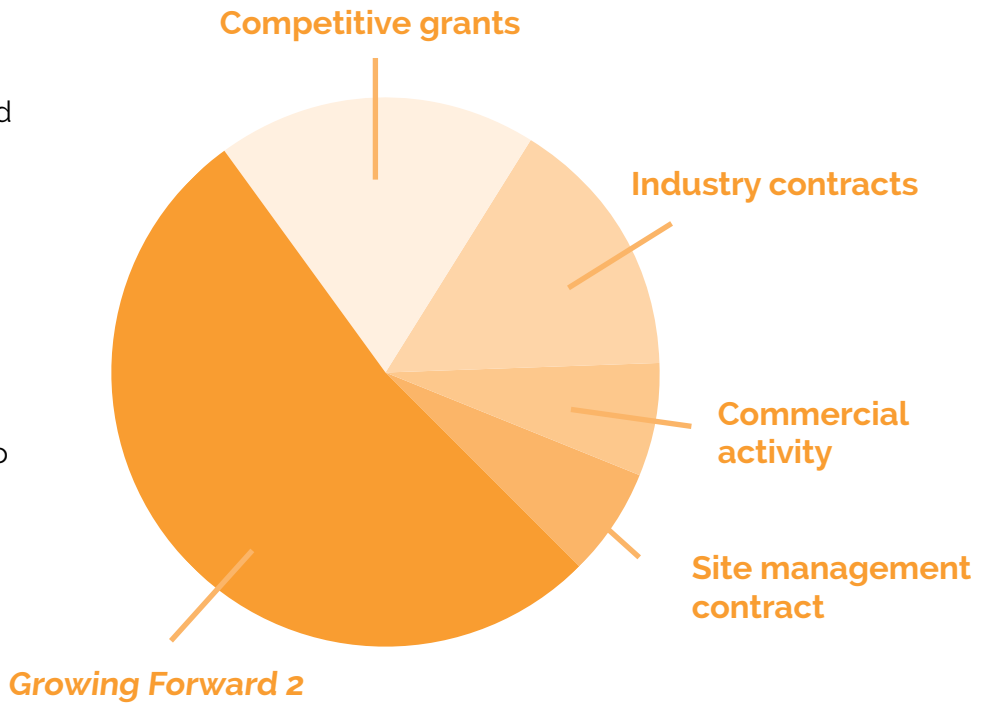
Information was collected from project partners and end users with input from research staff and collaborators. Qualitative and quantitative data was compiled by Vineland's research economist, Claudia Schmidt. The writing team was comprised of Tania Humphrey, Vineland's director of strategic planning, Lana Culley, director of business development and Cheryl Lennox, director of marketing and communications.

Vineland by the numbers

Since Vineland's inception, the organization has established horticultural research capacity that includes 19 research scientists with their own laboratories in a broad range of disciplines from biology, engineering to social sciences. The calibre of our scientists and their singular focus on research is illustrated by their ability to compete for research funding. Vineland maintains a high success rate on grant applications and has a research intensity on par with Canada's top universities.

Standard measures of scientific achievement aside, what really differentiates Vineland is our impact-focused operating model. Connections to industry are vital and, for our size, we maintain a large number of partnerships that include collaborators, clients and commercial licensees. This enables us to take a business approach to the research we do and helps to translate results into commercial success for our partners and impact for the sector.

Funding sources



TOTAL
$10.5 MILLION

Research capacity

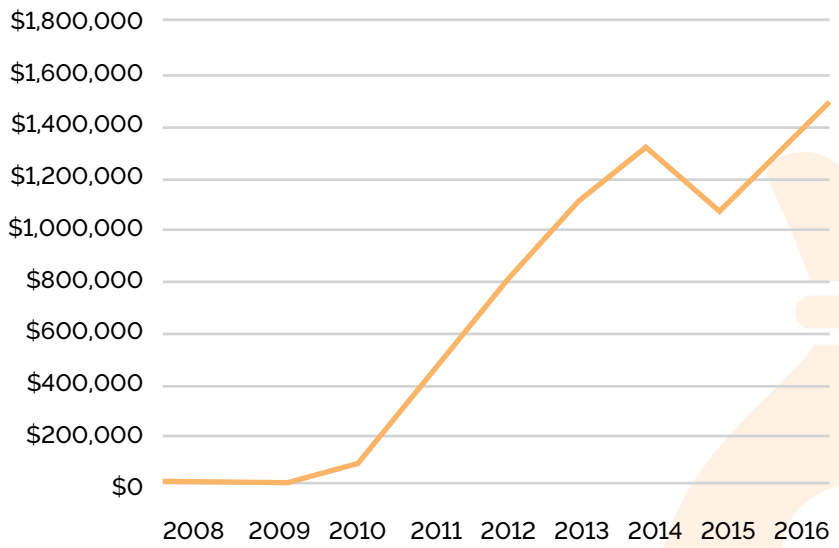
19
research scientists

1,130
square metres of research laboratories

7,615
square metres of research greenhouse and protected growing space

70
hectares of research farm

Industry investment



Research revenue

Grant application success rate

69%

Research intensity
(=sponsored research annual income per researcher)

$193K

$20K more than the Canadian university average

Partnerships

83 formal collaborations

58 industry **9** academic **16** government branches/agencies

Partners in
8 Canadian provinces and
11 countries

Stakeholder satisfaction

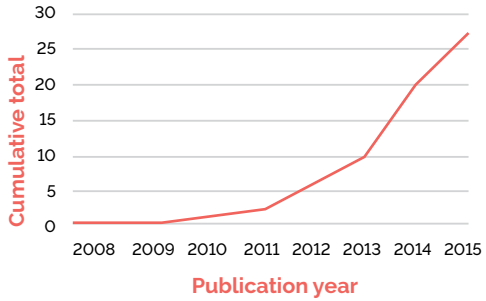
On a score of 1 to 7 where 7 is "strongly agree" and 1 is "strongly disagree"

I would partner with Vineland on research projects **6.0**

I would recommend Vineland's services to others **5.8**

I would adopt Vineland's research if applicable to me **5.9**

Scientific publications



Job creation

Currently employs **91** full-time staff

53 High value positions

Continued growth

Education and training

3 Master's students graduated since 2013

56% of Vineland researchers hold adjunct appointments at Ontario universities

6 Master's + **3** PhD's currently in progress

An average of **31** summer students, co-ops and interns hosted each year

Intellectual property (IP) and commercialization

7 patents filed for Vineland-developed technologies

47 plant varieties protected by PBR and/or U.S. plant patents

4 trademark applications filed

33 technologies commercialized

90 per cent of Vineland's protected IP is out-licensed and/or undergoing further collaborative R&D with business partners

With a highly-skilled research team, oversight from an independent Board of Directors, engagement from an international Science Advisory Committee and collaboration with more than 160 global partners including a Stakeholder Advisory Committee, Vineland's goal is to enhance Canadian growers' commercial success through results-oriented innovation.

We are an independent, not-for-profit organization funded in part by *Growing Forward 2,* a federal-provincial-territorial initiative.

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Published 2016

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Growing Forward 2
A federal-provincial-territorial initiative

Ontario

Canada