TWENTIETH ANNUAL REPORT OF THE ONTARIO APPLE GROWERS

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ONTARIO APPLE GROWERS

2023 BOARD OF DIRECTORS

Chair Cathy McKay ● **Vice Chair** Brian Rideout
Jeremy Veens ● Chris Hedges ● Joe Van de Gevel ● Brian Gilroy ●
Kyle Ardiel ● Kara Pate ● Robert Shuh ● Manus Boonzaier

GROWER COMMITTEE MEMBERS

Keith Wright ● Casey Cleaver ● Greg Ardiel ● Art Moyer ● Charles Stevens

ASSOCIATION DELEGATES

Fruit & Vegetable Growers of Canada (FVGC) ● Cathy McKay
FVGC Apple Working Group ● Brian Gilroy and Charles Stevens
Ontario Fruit & Vegetable Growers' Association ● Cathy McKay
President's Council ● Cathy McKay
Ontario Federation of Agriculture ● Joe Van de Gevel
F.A.R.M.S. - Steve Versteegh & Chris Hedges (alt.)
Labour Issues Coordinating Committee ● Brian Rideout
Horticultural Crops Ontario ● Kelly Ciceran
Ontario Fruit and Vegetable Convention ● Kelly Ciceran
Ontario Agricultural Commodity Council ● Robert Shuh

STAFF

GENERAL MANAGER ● Kelly Ciceran
PROJECT MANAGER* ● Larissa Osborne
MARKETING COORDINATOR* ● Kelle Neufeld
TREASURER* ● Kathi Ryan
OFFICE MANAGER* ● Sarah Burgstaler/Christina Stewart
*Shared Staff

CHAIR'S REPORT

It's been another interesting year for Ontario's apple growers. Climate conditions have challenged us again in some growing areas of the province. The two unwanted perils of frost and hail were experienced by some growers. However, the apple crop proved to be resilient and was harvested with excellent size, flavour, and colour. Our July crop estimate predicted a smaller crop than last year, but as the summer continued with adequate rain, and a perfect sunny and warm September, the crop got larger. We are estimating the 2023 crop to be 8.7 million bushels which is up 0.5% from the 2022 crop and up 11% from the 5-year average. In addition to our large crop, some of our competitors, such as Washington, also have large crops. We are always watching for their impact on our market. High transportation costs and favorable exchange rates can act as deterrents for businesses exporting apples into our market.

The cost of production continues to be a major issue for apple growers. Input costs continue to rise, including the annual increase to the minimum wage. The cost of borrowing money has also had an impact on capital and operating costs and so efficiency in our orchards has never been more important for us to be profitable. This year in partnership with OMAFRA, we have updated the Cost of Establishment and Production, a valuable document for those operating an orchard or those looking at starting an orchard. A copy will be sent to members and available on the web site.

The effect of inflation is felt by everyone - businesses and consumers alike. Consumers continue to buy and support local, but the price is the main factor as they stretch their shrinking dollars. It's imperative that we continue to raise the profile of Ontario apples in the marketplace and in partnership with the Ontario apple marketers. We appreciate their collaboration with the OAG and continued efforts to market and sell Ontario apples. Unfortunately, despite some strong years, there is now a sharp market decline for processing apples. Both juice and peeler apples have taken a downturn with many processors drastically reducing volumes needed.

Recently the Minister of Agriculture, Food, and Rural Affairs, Lisa Thompson, has recently announced two funding programs of relevance to the apples sector. On October 30th, she announced replant funding for Ontario apple, tender fruit, and grape growers. The program intake opened on November 20th and growers could apply for a maximum of $50,000. On November 20th, Minister Thompson and federal Minister McCauley announced funding for technology and equipment projects up to a maximum of $100,000. Both programs are being funded through the Sustainable Canadian Agricultural Partnership.

The OAG organized a very successful and well attended Tree Fruit Tech Day at Hedges Apples in late June. The goal of this event was to showcase new equipment and services and to demonstrate these new products to growers and stakeholders. The focus was on orchard efficiency and labour savings. Most equipment and services that were shown are available in the marketplace now, however there were a few new robots that are still in development.
Promotion and research are the two main areas for the OAG, and we are fortunate to have received funding – federal and provincial – to help fund these activities. I encourage you to read the promotional report and a summary of the research findings in this Annual Report.

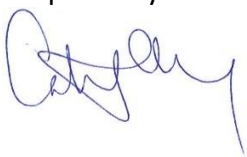
The past couple of years, the OAG Board has examined the Farm Products Marketing Act Regulations under which we operate. The OAG was formed in 2004, and now is the time for a full review to ensure that your organization is structured in a meaningful way that respects the needs of our changing sector. The Board made a proposal to our members in June and held a vote to gauge support changing the definition of 'producer'; introducing term limits for Directors on the Board; and amending an advisory committee. The OAG made a formal request to the Farm Products Marketing Commission to begin implementation of these changes. As this is a regulation change, it will take some time and we'll advise you when they are in place.

It has been my pleasure to be your Chair for the past 4 years. I will be stepping down in December, passing the baton forward. The best part of this job has been working with great people. I decided when I became chair that I would have a collaborative approach with Kelly Ciceran and my vice-chair, Brian Rideout. Not only have we had many serious conversations about the issues presented to us, but we have also had so much fun. This approach has worked very well, and we are still friends after 4 years - even with Covid thrown in. I had a couple of goals for my tenure; encouraging women to serve on the board and modernizing some of our governance regulations. I feel fortunate that both goals have been met to some extent.

Ontario apple growers should be very proud of the way our board functions and the caliber of the board members. Everyone gets along and we are a board that deals with lots of issues in a very productive way.

I thank the Board of Directors and the Committee Reps for their continued participation and for offering various perspectives on the many issues that we tackle. To our manager, Kelly, a big thank you for another year of great work on behalf of all apple growers. And to her staff - Larissa and Kelle – thank you very much for your hard work this year. As a Board, we appreciate the cohesive staff team who work collaboratively with the Tender Fruit Board, and many other partner organizations.

Respectfully submitted,



Cathy McKay
Chair

STRATEGIC PLAN

ONTARIO APPLE GROWERS

OUR WORK
We support the success of our members through promotion, advocacy, innovation and collaboration.

OUR VISION
Ontario Apples: The first pick for healthy consumers.

OUR MISSION
To foster a thriving industry and sustainable farms so that consumers can enjoy a wide variety of fresh, locally grown apples.

onapples.com

#ONAPPLEADAY

VALUES
Integrity
Collaboration
Leadership
Innovation
Respect
Quality

FOCUS AREAS

Promotion
Build consumer preference for Ontario grown apples and enhance public trust through the sharing of knowledge.

Advocacy
Advocate for growers in the areas of crop protection, workforce, BRM, and in reducing red tape.

Innovation & Competitiveness
Encourage and support progress through innovation, research, and technology transfer.

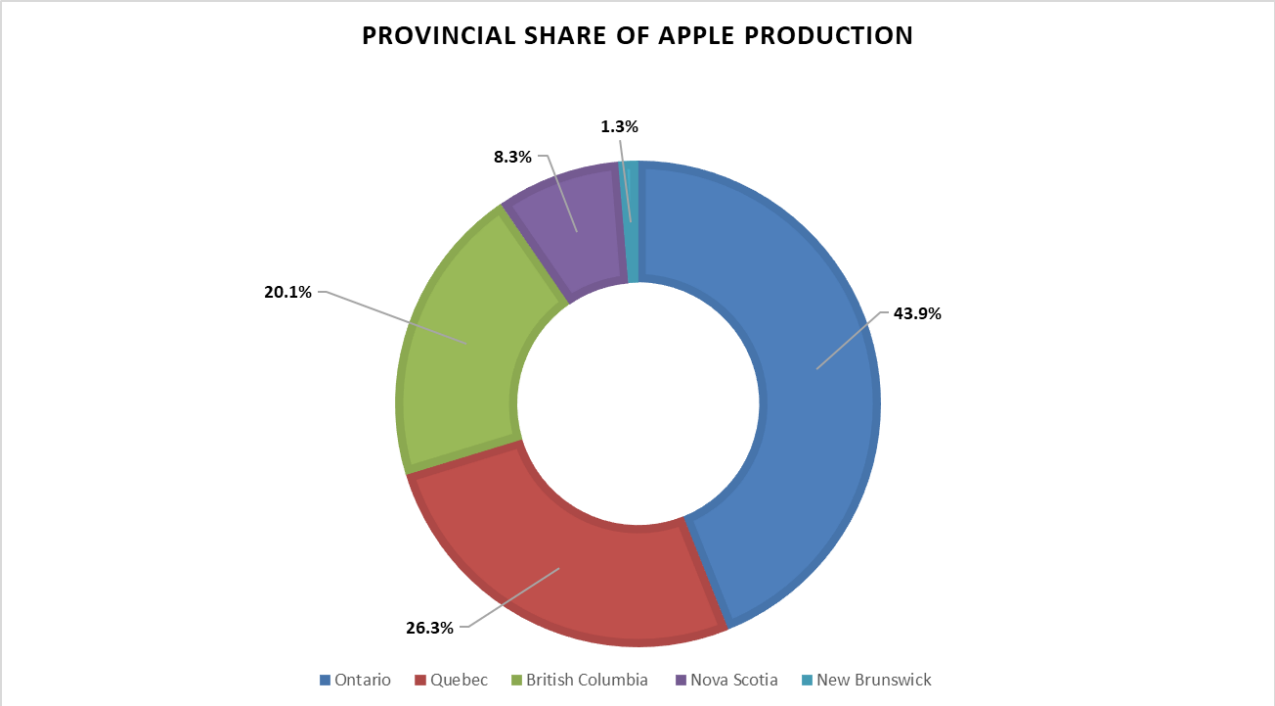
Operations & Governance
Improve Board and Committee effectiveness, encourage mentoring and succession planning, and update governance structure including policies to reflect future needs.

Member Information
Support improved fruit quality, profitability, and orchard efficiency through knowledge transfer and encourage the next generation of growers.

CORE FINDINGS

In Canada, apples are the 2nd most valuable fruit crop behind blueberries in 2022. Farm Gate Value (FGV) jumped 17% year-over-year reaching an all-time high of $285 million for 2022. Apples continue to be the most significant fruit produced in Canada in terms of tonnage and is the largest tree fruit crop by volume and value. Apples represented 20% of the total fruit FGV in 2022.

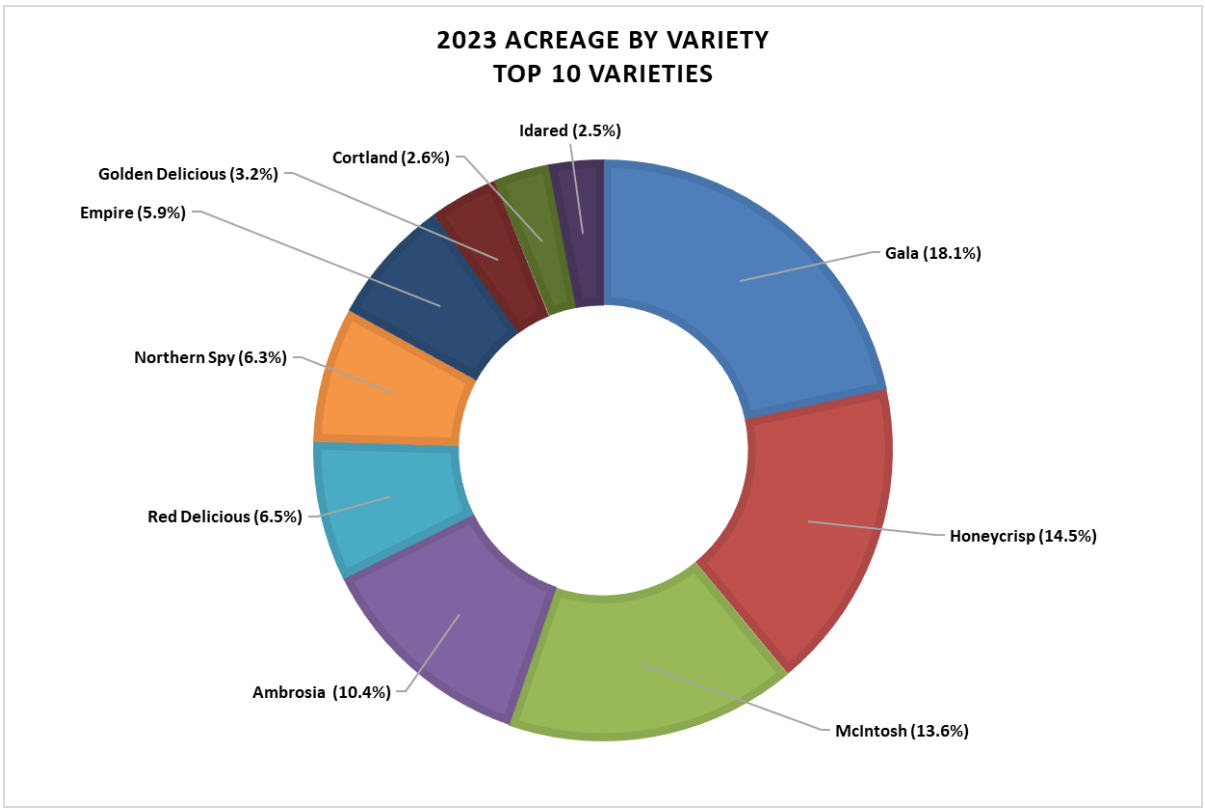
Over the last decade, Canadian production has been between 18.1 to 22.2 million bushels with Ontario continuing to be the largest apple producing province with 43.9% of the total volume in 2022.

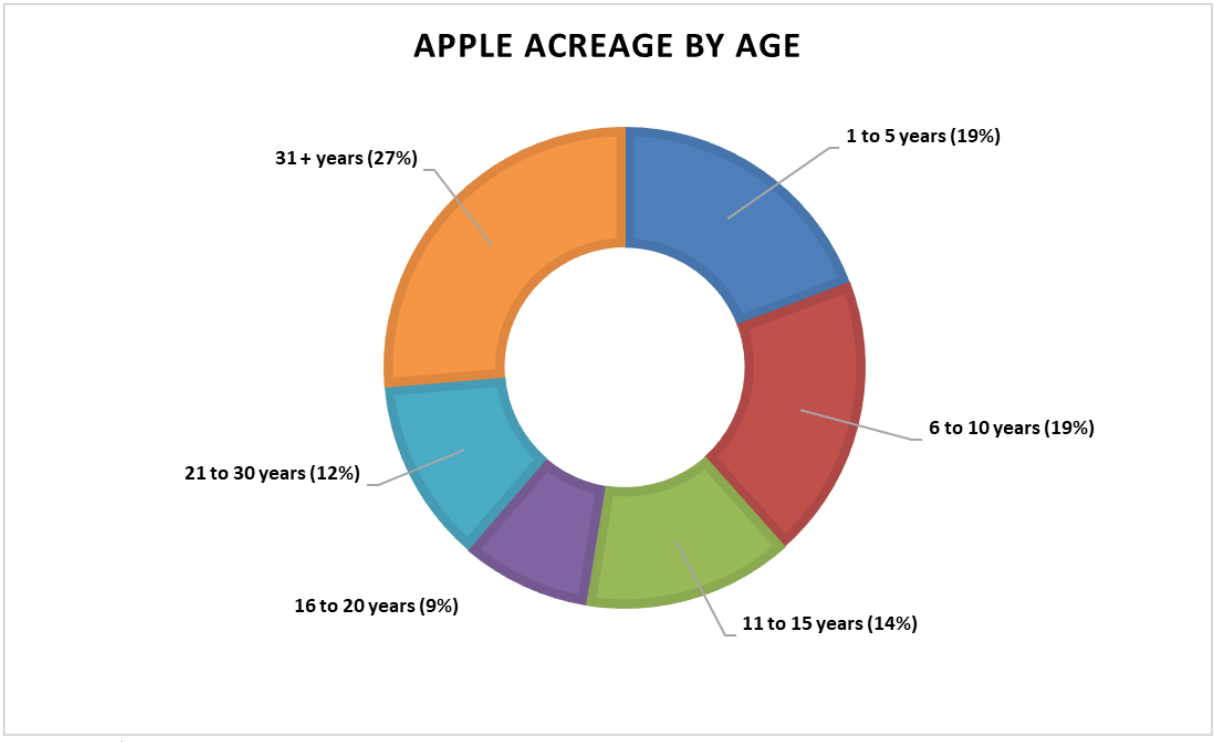


Source: Statistics Canada

Over the last decade, Canada's planted area has remained almost unchanged (44,099 acres in 2022 vs. 44,201 acres in 2013). Ontario's acreage has been stable year over year at 15,835 in 2022/23 vs. 15,753 in 2021/22. Quebec and British Columbia's acreage has declined 2.8% and 7.8% respectively. The maritime provinces have seen increases in acreage: Nova Scotia up 6.8%, New Brunswick up 95% (total acres is 1,076) and PEI doubled to 336 acres.

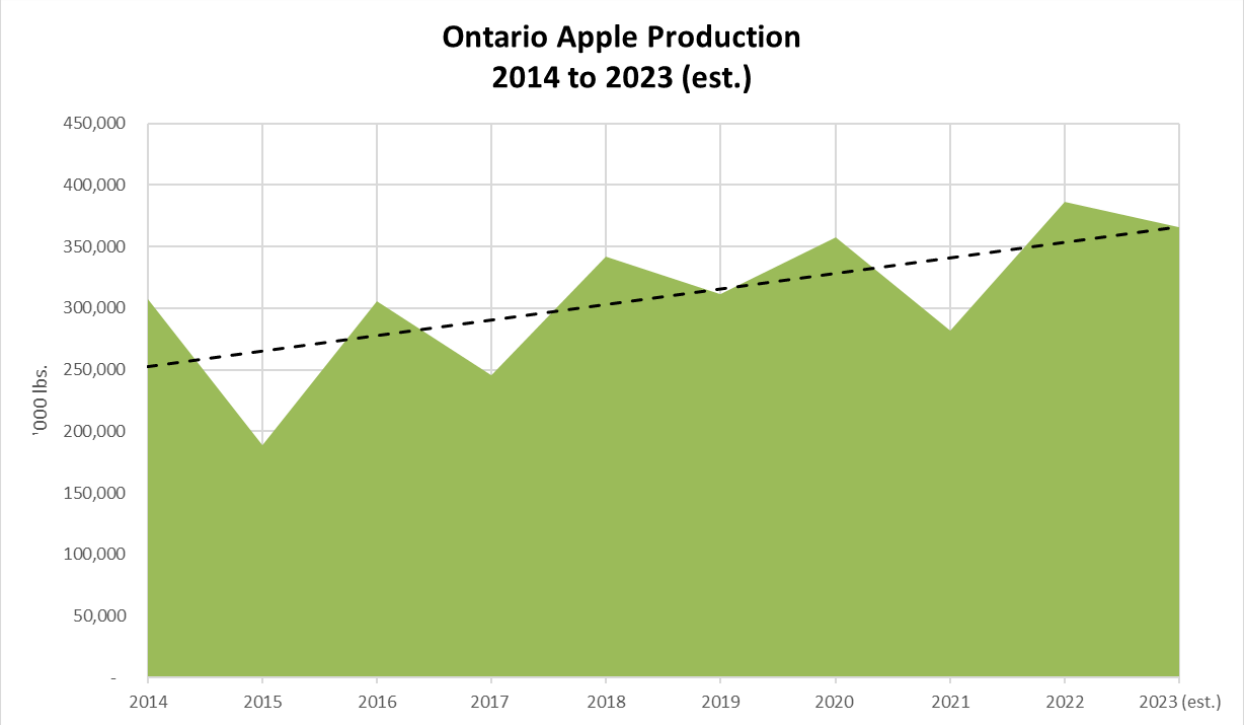
Ontario's tree census information (as of January 1st, 2023) is included in this report and is based on Agricorp's GPS mapping and information on total acreage provided by Statistics Canada. Agricorp continues to manage the DMS system in partnership with the OAG. The system provides reports on plantings by age, by variety and by district for all OAG members. Statistics Canada estimated that there is a total of 15,835 bearing and non-bearing acres in Ontario in 2022. The assumption is that the variety mix for the remaining acres is the same as for mapped acreage.





Source: OAG / Agricorp DMS

Ontario Apple Production - 2018 to 2023		
Years	**Production ('000 lbs.)**	**% Change from previous year**
2018	341,823	39.3%
2019	311,705	-8.8%
2020	357,813	10.3%
2021	281,845	-18.0%
2022	363,970	29.1%
2023 (est.)	365,610	0.5%
5-year ave.	**335,816**	8.5%
Source: OAG Annual Apple Marketing Survey and Apple Yield Estimate Survey		
2023 estimate excludes orchard juice		

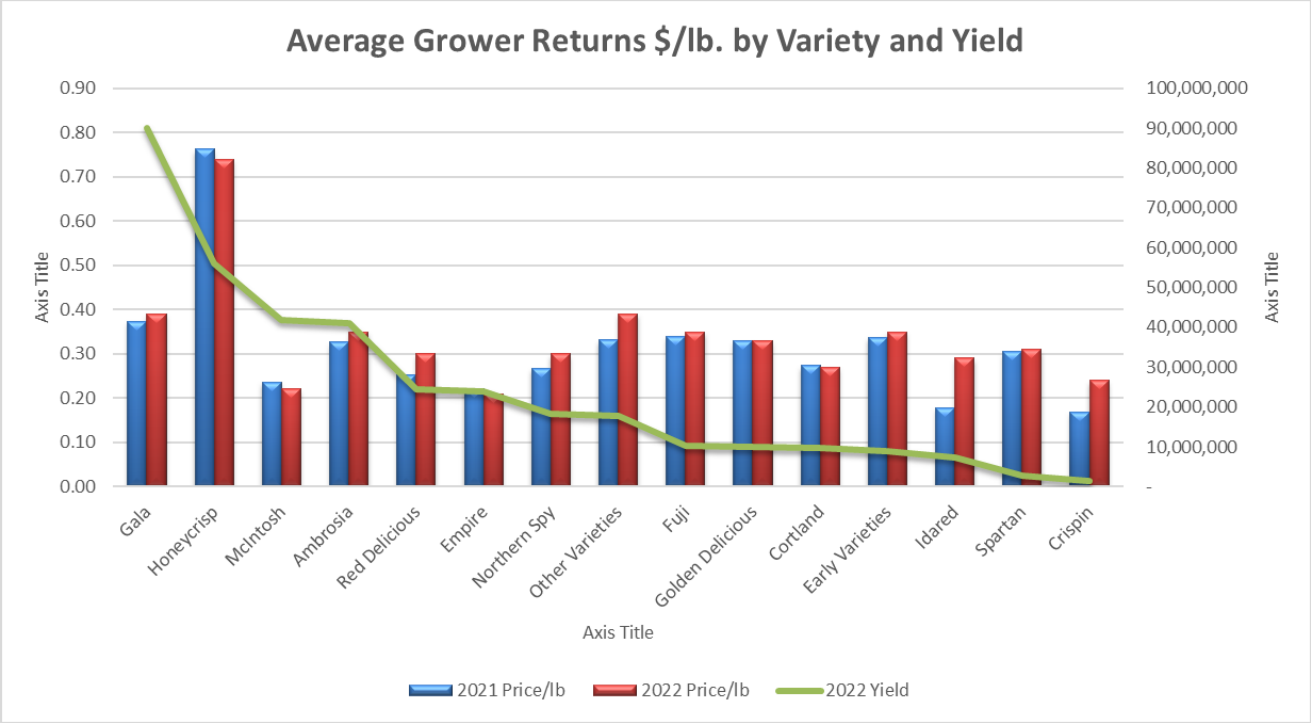


Source: OAG Yield Surveys

MARKETING REVIEW

The complete 2022 crop marketing survey including comparative figures from the 2021 year can be found in the Appendix. The survey provides the industry average returns per pound and per bin (840 lbs.) by variety and represents the prices for 100% of the apples in the bin, not just those for the fresh market pack out. With this information, growers and packers can compare their returns with the average. This information also provides valuable information for government programming.

Average Grower Price for fresh apples indicates that pricing was up $0.04/lb. across all varieties for fresh. The three top returning varieties are Honeycrisp at $0.74/lb. (down 3% vs. year ago), Gala at $0.39/lb. (up 3% vs. year ago), and Ambrosia at $0.35/lb. (up 7% vs. year ago).



Source: OAG Marketing Survey

Flyer Ad and Retail Price Tracking

The OAG tracks apple flyer activity at the major grocery stores. We record retail chain, variety, pack (bulk or bag), price/lb. and country of origin. There was a total of 405 flyer ads across all banners for the 2022 crop year, an increase of 24% vs. 2021 crop year. The information is shared with the apple marketers weekly. Additionally, we receive grocery store information on four varieties from Foodland Ontario. In store reps record price, tray or bag and share of shelf.

Storage Holdings

The OAG continues to collect storage holdings for the industry. Similar information is collected in other apple producing provinces. This information is entered into AAFC's InfoHort system and published on their website. The OAG summarizes the Canadian data and combines it with similar statistics on the U.S. crop and provides it to the marketers, storage holders and our grower members. The reports are shared in the OAG newsletters and are available on the web site. The OAG thanks all the storage cooperators for their excellent participation.

PROMOTION

Ontario Apple Growers (OAG) were successful in obtaining GGI funding this year which allowed us to execute a plethora of unique and exciting campaigns to remind consumers to choose locally grown apples all year long.

At the beginning of the season, OAG launched their autumn billboard campaign 'Fall in Love with Ontario Apples" (pictured), which ran from October to December, and then transitioned to "Buy Local All Winter Long" displayed from January through March. The eastbound billboard located at the Toronto Food Terminal sees an estimated 300,000 cars daily, making the total impressions for this campaign over 55 million.

Alongside this campaign, OAG placed their first-ever transit shelter ads throughout downtown Toronto. These ads demonstrated the versatility of Ontario apples in savoury recipes by picturing a bowl of apple cheddar soup with the tagline "Try Something New with Ontario Apples" to encourage consumers think outside of eating fresh out-of-hand or only using apples in baking. An estimated 10,000 commuters per shelter were exposed to the advertisements from November to December, bringing the total impressions to approximately 11 million.


AGRICULTURE

ADVERTISEMENT

Bite into Ontario apples – all year-long

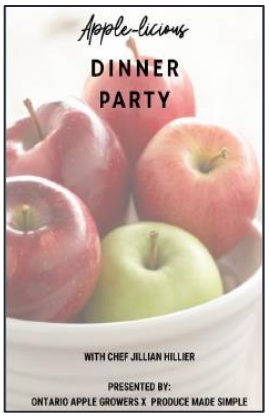
Throughout the winter, OAG ran a highly impactful digital campaign with Corus Entertainment. This included television commercials that showed viewers how Ontario apples get from the farm to their fruit bowl; radio tags explaining how to find local apples in stores all season long; and non-skippable ads on various online media demonstrating the versatility of Ontario apples in recipes. The total reach from January-March was an estimated 16 million consumers.

Another first-ever for OAG was the inclusion of sponsored content stories in the National Post newspaper in October, boasting about the bountiful harvest our growers were experiencing, and another in February, with a focus on the importance of storage technology (pictured). The articles performed very well, garnering a combined 318,000 social media impressions, plus an additional 12,900 website clicks and ad engagements.

OAG continues to grow its social media presence on Facebook and Instagram. With GGI support we were able to 'boost' specific posts to a targeted audience based on demographics and interests. These posts included seasonal agricultural worker stories, apple usage information, variety availability, recipes, and more. The boosted posts resulted in over 42,000 paid impressions and a whopping 478,500 engagements from nearly 15,000 followers combined.

We would like to sincerely thank the Ontario government for their continued investment in the Ontario apple sector.

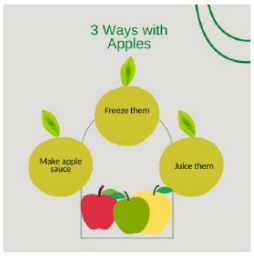
OAG executed additional activities this season to promote the versatility of Ontario apples. Working with a local chef, in partnership with Produce Made Simple, we launched an 'Apple-licious Dinner Party' e-booklet where Ontario apples were used in every course.

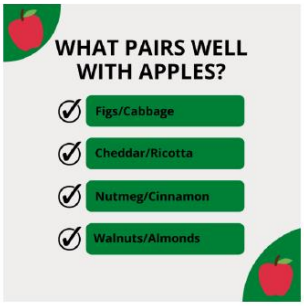


Paid media appearances with registered dietitians and food influencers also took place on Global TV, CHCH and CP24 throughout the winter months to remind consumers to buy local.

Produce Made Simple Partnership

Ontario Produce Marketing Association's (OPMA) "Produce Made Simple" works with amazing brand ambassadors to deliver exceptional and engaging content each apple season. This year, 5 new apple recipes were released – apple cider donuts, apple and delicata salad, apple buckle streusel, apple cinnamon roses and apple sausage sheet pan bake. Produce Made Simple also displays Ontario apples prominently on their website homepage for the months of October and February, features apple recipes and educational content in the newsletter, and has seen over 1.6 million impressions on social media relating to the promotion of Ontario apples.





Foodland Ontario Promotions

Television and Radio

Foodland Ontario showcased Ontario apples in 25 television appearances from August to March reaching an audience of 278,000 consumers province wide. They also ran radio tags during the weeks of Sept 5th and Oct 3rd which gained 3 million impressions weekly across 40 stations.

Recipe Releases

Foodland Ontario's recipe releases encourage more than 450 print, online, and broadcast media outlets to write and talk about fresh Ontario food. Ontario apples were featured in the September/October, November/December 2022, and January/February 2023 recipe releases, and in the Fresh Perspectives newsletter.

Website and Calendar

On the Foodland Ontario website, approximately 110 recipes can be found that call for Ontario apples as an ingredient. Online recipes can be found at: www.ontario.ca/foodland/recipes. In the calendar, Ontario apples were featured for the month of February 2022 in the Apple Loaf Cake and again in the 2023 Calendar's Festive Mocktail Sangria recipe. 250,000 English and 2,500 French copies of the Foodland Ontario calendars were distributed across the province at grocery retailers, farmers' markets and on farm markets.

Social Media

Foodland Ontario actively promotes Ontario apples across all social media channels with organic and paid ads (see chart below). The results of these efforts were as follows:

- **Facebook** reached approximately **141,938 users** and initiated over **3,350 engagements.**
- **Instagram** generated **64,881 impressions** and **2,330 engagements.**
- **Twitter** gathered **11,708 impressions** and **304 engagements.**

Month	Total Impressions (FR/EN)	Total Link Clicks (FR/EN)
August	27,965,181	25,015
September	22,640,886	23,006
October	8,313,368	6,722

Retailer Display Contest

This initiative encourages retailers and merchandisers to engage in friendly competition with other grocery stores to create award winning displays in their produce sections. The Fall Apple

Retail Display Contest ran from September 1st to November 14th and saw 239 entries – a 35% increase in entries from 2021. The winter display contest was executed January 16th to March 31st and had 182 entries, up 32% vs. the winter contest held in 2020.

OAG extends its gratitude to our partners for their contributions towards promoting Ontario apples. Follow @ontarioapples on social media and share your apple posts with us using the hashtag #ONappleAday!

ADVOCATING FOR COMPETITIVENESS AND INNOVATION

The Ontario Apple Growers objectives for this strategic direction are to:

- ✓ Advocate to maintain and improve access to crop protection tools to ensure grower competitiveness and sustainability
- ✓ Ensure growers have a reliable access to a qualified workforce
- ✓ Improve effectiveness of Business Risk Management (BRM) programs to help growers manage risks and stimulate industry growth
- ✓ Reduce regulatory overload on growers

AgriStability

AgriStability covers margin declines caused by any combination of production losses, adverse market conditions or increased costs. If a producer's margin falls below 70% of their recent average, AgriStability helps to offset the difference. The provincial portion of the compensation rate for AgriStability has been increased from 70% to 80%. This is being paid as top-up, which will be paid separately from any initial AgriStability payments. The following table shows Apple AgriStability Program participation and payments. Reporting is done by sector and can fluctuate year to year, as the annual sector determination is based on program-year reported income. Sector determination (apple, G&O, cattle, etc.) is based on income at or greater than 50% of total reported income in the program year. This means that an "apple" producer could be reported as a grain and oilseed producer (for example) if their apple income is less than 50% of their total reported income.

AgriStability Apple Statistics

(As of September 2023)

Year	Processed	Payments	Total $	Average $
2022	43	<10	75,938	unknown
2021	122	10	291,400	29,140
2020	133	17	488,167	28,716
2019	134	20	491,876	24,594
2018	140	23	911,363	39,624

Note: Processed statistics represent files processed as of September, 2023.

Agri-Insurance (Production Insurance)

Production Insurance covers production losses and yield reductions caused by insured perils. Growers can choose the type and level of coverage that best meets their needs. The OAG communicates to government the needs and ensures a production insurance plan that is responsive to the changing needs of the Ontario apple sector.

Apple Crop Insurance, 2013-2023
(as of October 2023)

Year	Accounts	Liability ($000's)	Total Premiums* ($000's)	Grower Share of Premiums ($000's)	Total Claims** ($000's)
2023	138	104,367	14,460	7,553	unknown
2022	133	95,146	14,466	7,589	2,189
2021	139	85,382	12,740	7,030	15,325
2020	140	75,619	10,195	5,344	5,234
2019	137	69,503	9,863	5,170	6,384
2018	135	62,202	9,292	4,811	4,569
5-year average (2018-2022)	**137**	**77,570**	**11,311**	**5,989**	**6,740**

*Total grower and government premiums

**Claims data refers to approved claims only

AgriInvest

AgriInvest is an additional business risk management program that producers can use to either cover small income declines or support other investments. Each year, producers can deposit up to 100% of their Allowable Net Sales (ANS) with the first 1% matched by governments. The limit on matching government contributions is $10,000 per year. ANS are the net sales of most primary agricultural commodities. Producers can withdraw funds at any time.

Self-Directed Risk Management (SDRM)

Ontario's Risk Management Program (RMP) helps producers manage risks beyond their control, like fluctuating costs and market prices. Under the RMP plan for edible horticulture, producers deposit funds into self-directed risk management (SDRM) accounts and the deposit matched by the government to help mitigate risk associated with farm business.

Agricorp sends personalized participation forms along with the Handbook (for new participants) and the Rates, Dates and Updates Information Sheet to eligible producers in September. The participant handbook and information sheet work together to provide all the information you need to participate in SDRM.

Commodity Loan Program (CLP) & Advance Payments Program (APP)

Apple growers currently have access to two government cash advance programs through Agricultural Credit Corporation (ACC). These programs are available to all apple growers in Ontario.

The **Commodity Loan Program (CLP)** is a provincial government cash advance program that provides up to $750,000 of available financing at bank prime rate. The program begins in October of each year, and advances are required to be paid the following year in September (24 months). Producers must utilize production insurance to participate.

The **Advance Payments Program (APP)** is a federal government cash advance program that provides up to $1,000,000 in available financing to producers. At minimum, the first $100,000 is interest-free, with the balance at the bank prime rate. Apple growers can access this

program starting April 1st of each year based on anticipated production using either Production Insurance or AgriStability insurance. After October 1st of each year, security may be based on inventory on hand, without the Production Insurance or AgriStability requirement.

The application process can be completed by the producer by simply contacting the Agricultural Credit Corporation office and completing the application over the phone with one of their trained staff. Producers who are interested in applying or have questions regarding either program can contact the ACC office for further information at 1-888-278-8807 or by visiting www.agcreditcorp.ca for details and updates.

KEEPING MEMBERS INFORMED

Communication to the membership continues to be an important activity for staff. Along with our newsletters, the OAG also continues to distribute OMAFRA's *Orchard Network Newsletter* four times a year.

The OAG web site continues to be a central location for information. Members can use their grower number to access information on the web site in our Growers only section. Information posted there includes Health and Safety Programs for Employers and Employees, newsletters, and industry statistics are always available here as well. There is also a Classifieds section on the Grower section of the website.

Cost of Establishment and Production (COP)

The OAG staff and OMAFRA specialists have updated the COP resource for 2023. The document provides a full cost of establishment and production for high-density orchards. The medium density portion of the COP is for a mature orchard only. There have been significant cost increases since the last version of the COP done in 2019. For a copy of the COP please contact the OAG office.

Worker Health & Safety

Health and Safety templates are available to OAG members and are on the Grower section of the web site. These templates are regularly reviewed by Worker Safety and Prevention Services to ensure that they are updated with current requirements.

Croptracker

The web-based system Croptracker is available to Ontario Apple Growers members as an online system providing a comprehensive tool for growers. Developed especially for the fruit and vegetable industry, the Canadian-made crop management software platform is used by growers, associations, and cooperators of all sizes. The platform schedules and tracks crop protection use, harvest data, cuts operational costs associated with creating GAP reports and auditing, enhances traceability, and provides data so operators can make more informed decisions.

In partnership with the Ontario Tender Fruit Growers, we have helped develop modules to integrate aggregate data collection and reports. For example, Form 1s, storage holdings, yield estimates and marketing information will be submitted electronically. The development of this enterprise system will speed up data collection and dissemination of information, which will greatly benefit the activities undertaken by the OAG.

Tree Fruit Tech Day

On June 27th, over 100 growers and stakeholders from across the province came together in the Simcoe area to view demonstrations on new orchard technologies. The OAG would like to extend a huge thank you to the sponsors who made this tour possible, our host Hedges Apples, the OMAFRA staff and students, and our speakers.

Fire Blight Risk Maps

Fire blight is a very devastating bacterial disease of apples and pears. The models available (Maryblyt and Cougar Blight) are intended to be site specific. However, many apple growers have indicated time constraint challenges in collecting and entering environmental data daily into the models to determine fire blight infection risk during bloom.

New for the 2023 season, OMAFRA partnered with Weather Source to provide OnPoint Weather. The locations on the map are based on agricultural production and use all nearby weather data and geography to provide accurate forecasting data. The 7-day weather forecast data from 50 sites, representing most areas where Ontario apples are grown, was put into the Cougar Blight model, and updated 3 times per week during apple blossom time May 1 - June 22, 2023. Risks were developed into animated maps that were posted on the ONfruit blog and the link was emailed to OAG members.

A recap of the year can be found on ONfruit at http://www.onfruit.ca/fire-blight-map. Maps received over 1,300 unique pageviews over the risk period, an increase of over 30% from previous years. The OAG sincerely thanks and acknowledges the OMAFRA apple team and GIS specialists for delivering this valuable service to the Ontario apple growers in 2023.

Ontario Young Apple Farmers

Since 2014, the Ontario Young Apple Farmers group has been bringing together new and young apple farmers in Ontario as a way for them to network and learn from each other. The group continues to grow with over 65 members and uses a chat group to continue their conversation and learn from each other daily. There wasn't an opportunity to meet in 2023, but many members of this group participated in the Tech Day held in late June.

IMPROVING FRUIT QUALITY AND ORCHARD EFFICIENCY

Research and Development

The OAG continues to secure research grant funding wherever possible to meet the growing list of research priorities. Each year, the OAG Research Committee reviews minor use priorities, discusses research project results and new proposals. Our research priorities are as follows:

1. Technology, Mechanization, Automation & Efficiencies

Increased production efficiencies using the latest technologies and precision agriculture that take into consideration the economic viability for apple growers. Research could include:

- Labour efficiencies
- Pest management and crop protection efficiencies
- Weather risk efficiencies
- Water use efficiencies
- Modelling (for example, Ontario solutions using existing models for crop load management and integrated pest management)
- Remote sensing, software development and robotics
- Technology in storage and packing efficiencies
- Orchard design

2. Sustainable Practices

Optimizing sustainable cropping practices for conventional or organic production according to variety and climatic conditions. Research could include:

- Crop load management
- Training systems
- Carbon capture
- Irrigation
- Fertigation
- Soil management
- Nutrition

3. Maximizing Quality & Minimizing Losses

Crop maturity management and post-harvest storage conditions and treatment strategies with the goal of delivering a larger percentage of high-quality fruit for the fresh market. Research could include:

- Post-harvest research developing storage regimes for in-demand varieties
- Optimal harvest management and timing

- Strategies to reduce storage disorders

4. Variety & Rootstock Development and Evaluation

Variety and rootstocks development and selection according to consumer preferences and their performance in the different regions with the goal of achieving greater market share. Research could include:

- New variety breeding and evaluation
- Scion and Rootstock evaluation (i.e., winter hardiness, drought efficiency)
- Genomics
- Consumer preference studies

The following is a synopsis of the many research projects that the Ontario Apple Growers has either managed or provided support (financially or in-kind).

Improving outcomes for Ontario apple producers though precision agriculture and labour efficiency strategies – Dr. John Cline, University of Guelph, E. DeBrouwer, and J. Molenhuis, OMAFRA, C. Bakker and L. Reis, University of Guelph

A three-year Univ. of Guelph/OMAFRA Alliance project funded in part by the OAG, was initiated in 2020 to investigate advanced precision crop load management strategies and mechanical pruning in Ontario apple orchards. The overall aim of the project is to reduce the reliance on manual labour, increase orchard fruit quality and efficiency, and decrease the need for manual hand thinning and pruning.

There are three components to the project:

A. Crop load management
    a. Compare and validate crop load management models in development or not in use in Canada (Carbohydrate Model, Pollen Growth Tube Model and model called BreviSmart in development by ADAMA).
    b. Evaluating the pollen tube growth model developed and used in the USA.
    c. Determine the effect of chemical thinning on uniformity (variation) in fruit size distribution.
B. Exploring the benefits of mechanical hedging
    a. Measure the cost-benefit analysis of mechanical hedging on labour savings
    b. Measure apple tree response to mechanical hedging at different timings in combination with dormant hand pruning on tree health
    c. Perform a cost-benefit analysis of hedging in the winter and summer for the purpose of reducing labour, increasing light penetration (summer), and increasing bud formation (summer).

Experiment 1.1: Response of Gala apples trees to timing of mechanical pruning/hedging on fruit quality, production, size distribution, vegetative growth and return bloom.

A high-density tall-spindle block of Brookfield Gala/M.9 trees spaced 0.9 x 3.0 m (3175 trees/ha) planted in 2017 will be used for this experiment. Starting in the winter of 2019/20 trees were pruned using a mechanical hedger (Model CRF280, Rineri Manufacturing, Italy). The pruning bar was maintained vertically to ensure a uniform canopy width between the top and bottom of the tree. The top cutting bar was kept 30 cm above the top wire to maintain a tree height of 2.80 m. Treatments included trees hedged at 30, 60 and 90 days after bloom and when dormant. Touch up dormant hand pruning to remove dead and diseased wood, low lying

limbs, vertical limbs, and vigorous shoots (with a diameter > 50% of their attending branch) was also performed as necessary. Tree canopy width, crop load, time to prune and notes on ease of management and suitability for mechanization will be made. In addition, shoot extension growth, fruit size distribution, mean fruit size, total yield and marketable yield, fruit colour, fruit quality, current season vegetative growth, pruning weights, and return bloom will be measured.

Data will be collected on the labour hours used manually for each pruning session, labour hours used by mechanical hedger for each pruning session, fuel/maintenance used for mechanical hedger at each pruning session, and observations on tree and fruit condition for each method. Cost analysis will be performed in consideration of increases in available cash due to factors such as increased fruit size, production and quality, reduction in cash outflow in labour savings, added cash outflow from mechanical hedger operating and ownership costs, and decreases in available cash due to factors such as tree and fruit damage, reduced yield, or quality. The final data set will be analyzed in the winter of 2023/24 and the outcomes reported to growers through popular press articles.

Experiment 2.1: Efficacy and timing of chemically thinning apples with the metamitron
A three-year investigation on the efficacy of metamitron, a new thinning compound in development by Adama Canada Ltd. will be evaluate on Gala or Ambrosia trees. The primary goal will be to evaluate different rates and timings of metamitron and use of a surfactant on thinning efficacy and to compare these with hand thinned and 6-BA and carbaryl controls. Trees will be assessed for fruit set, yield, weight, tree growth, commercial size distribution and return bloom.

Experiment 2.2: Efficacy and timing of thinning apples with the new compound 1-ACC
A three-year investigation will investigate the efficacy of 1-ACC, a new thinning compound in development by Valent BioSciences. The primary goal will be to evaluate different rates, timings, of 1-ACC on thinning efficacy and to compare these with hand thinned and 6-BA and carbaryl controls. Trees will be assessed for fruit set, yield, weight, tree growth, commercial size distribution and return bloom.

Experiment 2.3: Evaluating available fruit thinning models (Malusim, BreviSmart and Pollen Growth Tube Model) to assist with timing and rates of chemical fruitlet thinners and blossom thinners.
Experiment 2.3.1 Efficacy of using Malusim and BreviSmart to determine the rate of chemical thinner.
This experiment is being conducted at the Simcoe Research station and grower sites to evaluate the Malusim and BreviSmart fruitlet chemical thinning online models. The Malusim model runs on the NEWA platform (available via Cornell University) and unfortunately, we have been unable to have obtain approval to link into this network. The BreviSmart fruitlet model is available for research evaluation and is being optimized by Adama Canada Ltd. It is our understanding the model will be available when Brevis is registered in Canada.

Experiment 2.3.2 Efficacy of a Pollen Tube Growth Model to determine timing of blossom thinner application.
Beginning in 2020, a blossom thinning experiments was conducted on Brookfield Gala trees (2020, 2021) and Honeycrisp (2022) at the Simcoe Research Station to explore the efficacy of thinning with lime ATS and lime sulphur with and without post-bloom sprays of carbaryl

combined with 6-B. Application timing was determined using a pollen tube growth model (PTGM) developed in the United States. Trees will be assessed for thinning efficacy, crop load, fruit size and yield, commercial size distribution and return bloom. Preliminary observations indicate blossom thinning treatments are effective in reducing crop load and increase fruit size.

Experiment 2.3.3: Pilot testing of Malusim and Pollen Tube Growth Model (PTGM) predictive models with Ontario Apple Growers Producers

The project aimed to collect real-time temperature and solar radiation data from Onset weather stations in 3 to 5 Ontario orchards to tie into the NEWA Malusim and PTGM models for Ontario growers. Tree fruit specialists were to coordinate with growers how to use the output from the models and their experience in using the models to improve precision thinning strategies, and the likelihood of broader industry adoption. Despite several attempts to engage NEWA, regrettably no substantive progress has been made with Cornell University to access these models on the NEWA website using real-time and forecasted Ontario weather.

Data for experiments 2.1, 2,2, 2.3 have been partially reported on in the *Orchard Network.* At the conclusion of the project, detailed results will be made to the funding agency, the OAG and apple producers.

Assessing the Effectiveness of Biocontrol and Rootstock on Controlling Apple Replant Disease - M. Mechler (UoG PhD Student), Dr. J. A. Cline, and A. Beneff, University of Guelph.

This is a three-year University of Guelph/OMAFRA Alliance project, partially funded by the OAG. It was initiated in 2020 to investigate the effect of biocontrol treatments and disease-resistant rootstocks on apple replant disease (ARD) in Ontario orchards, as well as characterize the rhizosphere microbial community changes of these approaches. This project aims to increase orchard health and productivity, tree survival and fruit quality and offer alternatives to chemical fumigants.

The research is comprised of two experiments, and the objectives are as follows:

1. **Ontario Orchard Biocontrol Experiments**
    a. Compare soil characteristics, tree health, and tree growth between three biocontrol treatments and a conventional fumigation practice.
    b. Evaluating the microbial composition of rhizosphere soil in each treatment.
    c. Determine microbial species associated with Ontario ARD and characterize the effect of biocontrols on them.
2. **Greenhouse Rootstock Experiments**
    a. Compare soil characteristics, tree health, and tree growth between three commonly used commercial rootstocks and seven rootstocks developed for soil disease resistance.
    b. Evaluating the microbial composition of the rhizosphere soil of each rootstock.
    c. Determine whether microbial composition differs per rootstock, or different rootstock show different sensitivity to the same microbial community.

Experiment 1: Ontario Orchard Biocontrol Experiments

Field research concluded in early October 2022 at the three orchards in Norfolk County: Hedges Apple Farm (high-density replant orchard), Simcoe Research Station (medium-density replant orchard), and Schuyler Farms (low-density replant orchard). The field data of all three growing seasons have been statistically analyzed. Various analyses have been completed to assess tree

growth, tree health, soil nutrients, and rhizosphere microbial composition. This full set of data has demonstrated that our plant growth-promoting rhizobacterial (PGP-R) biocontrol treatment had similar positive effects on tree health and growth as conventional soil fumigation. However, rhizosphere soil DNA analyses have shown that these two treatments developed very different microbial communities and improved tree growth by different means. The PGP-R treatment decreased rhizosphere fungal diversity while chloropicrin reduced rhizosphere bacterial diversity.

Experiment 2: Greenhouse Rootstock Experiments

Two greenhouse experiments were conducted in the winter of 2021 and 2022. The experiment was modified for 2022 based on 2021 outcomes. These modifications improved the experimental design, statistical power, and consequently provided a greater number of significant results than the year prior. As with the field experiments, all analyses have been completed to assess rootstock growth, tree health, soil nutrients, and rhizosphere microbial composition. Our data has demonstrated differences in rootstock growth due to genotype and soil (pasteurized vs. replant soil). It also has demonstrated which rootstock were most impacted by replant disease. As expected, M.9 and Bud.9 benefited from pasteurization, showing a lower resistance to ARD. Unexpectedly, G.41 did as well. G.214 and B.10 showed the greatest and most uniform growth in both the pasteurized and ARD soil. Less dwarfing and greater rhizosphere fungal diversity were two features of the rootstocks that correlated with greater ARD resistance.

Research updates are posted on the research blog, www.applereplantdisease.wordpress.com.

Incidence, timing of infection, and management of bitter rot in Ontario - Asifa Munawar, John Watson, Vivian Adam, Erik Ellenberger, Mary Ruth MacDonald and Katerina Jordan, University of Guelph, Kristy Grigg-McGuffin, and Katie Goldenhar, OMAFRA

Apple bitter rot caused by (Colletotrichum spp.) is an emerging disease in Ontario. Before 2010, the disease was mostly documented in the southern USA, Central, and South America. The fungus can live asymptomatically in apple fruit before inducing visible symptoms. This mechanism of infection leads to the sudden appearance of symptoms, especially in storage. The cryptic nature of this pathogen makes it challenging to control since the timing of fruit infection is not known under Ontario conditions. There are also reports from the USA of developing fungicide resistance in Colletotrichum isolates.

Objective 1: Thirteen to fifteen apple orchards were scouted from September to November 2019-2020 for visible symptoms of bitter rot on fruit. The incidence of bitter rot was primarily recorded on the cultivars Empire and Ambrosia, in the absence of any of these cultivars, the cultivar Honey Crisp or Gala was selected. In each study orchard, 100 asymptomatic fruit per cultivar was collected for post-harvest analysis. The cumulative incidence (in-field plus in-storage) of bitter rot was low to medium in both growing seasons with Empire having the highest incidence followed by Ambrosia. In terms of districts, district 2 had the highest incidence.

Objective 2: The timing of fruit infection was studied by weekly inoculation starting from the fruit set (fruit size 3-5mm) and weekly collection of asymptomatic apple fruit from the selected orchard from 2020-2022. The inoculum presence in the orchard was measured by collecting fungal conidia in rainwater. Weather data of the study orchard was collected to determine the periods of infection risk of the disease using the HOBO weather station. The result indicated that apple fruit can become infected at any stage of fruit development. The symptoms may or may

not appear in the field depending upon the inoculum presence in the orchard, and favorable weather conditions. The symptoms were observed in the field starting from fruit size 6.4mm and above, and at post-harvest.

Objective 3: Sixty-two bitter rot isolates were tested for their sensitivity to pyraclostrobin, and 54 isolates were tested for Captan using colony growth inhibition assays. Forty-two bitter rot isolates were tested for pyraclostrobin using spore germination assays. The fungus was found sensitive to pyraclostrobin at low concentrations (<1ug/ml). The commercial fungicide Captan was able to inhibit 50 % of mycelial growth at <100ug/ml. This indicated both these products should still be effective for Ontario growers to use in their orchards.

In conclusion, the incidence of bitter rot in Ontario orchards remained low to moderate in 2019-2020. The apple fruit can become infected from petal fall to harvest. The fungal isolates collected from Ontario orchards were found sensitive to pyraclostrobin (active ingredient in Pristine) and Captan. In our study, although Colletotrichum fioriniae was the dominant species, two more species (C. godetiae and C. nymphaeae) were also found as causal agents of apple bitter rot in Ontario.

The project is funded by the Ontario Agri-Food and Innovation Alliance with support from the Ontario Apple Growers.

Study and Management of Summer Diseases of Apple - Asifa Munawar, John Watson, Lisa Webber, Mary Ruth MacDonald and Katerina Jordan, University of Guelph, Kristy Grigg-McGuffin, and Katie Goldenhar, OMAFRA

Summer diseases of apples such as bitter rot and black rot (frogeye leafspot) are becoming more prevalent in Ontario orchards. Bitter rot was not even a concern in Ontario before 2010 but climate change has contributed to the increased incidence of both diseases. Bitter rot is caused by many species in the Colletotrichum genus, and although the predominant pathogen in Ontario is *C. fioriniae*, our recent results show the presence of more species in Ontario orchards. These species could vary in their response to fungicides; therefore, this is the best time to determine more species involved and to craft management strategies for apple growers. A discussion with OMAFRA specialists also indicated the sector needs to manage black rot on younger apple trees. This project will investigate potential bio fungicides to control these pests in efficacy trials and the study results will provide more tools and knowledge for apple growers to manage these diseases.

The objectives of this project are, 1) detecting and identifying various species of Colletotrichum in Ontario orchards, 2) determining early resistance in different species of Colletotrichum using a molecular marker, 3) efficacy of calcium chloride and different fungicides to better manage the bitter rot disease, 4) establishment of a new orchard and determining the efficacy of various chemical and bio fungicides to control frogeye-leaf spot (black rot) on the leaf and stem of apple plant.

In objective 1, more than 3,000 apple leaf and fruit samples were collected in fall 2023 from various orchards across all districts. These samples will be tested for the presence of Colletotrichum spp. The isolated species will be identified and used to test early resistance which is part of objective 2. The work in objective 2 will start in year 2 (2024-2025). In objective 3 (previously objective 4 of the bitter rot project) apple trees were planted in May 2022, to carry

out an efficacy trial in the 2024-2025 field season at the Ontario Crop Research Centre, Simcoe. A total of 203 trees of the cultivar 'Ambrosia' and 203 trees of the cultivar 'Empire' were planted. 2022 and 2023 are the establishment years of the orchard, in 2024 we will start testing the efficacy of the various products to control bitter rot. In objective 4 a new orchard was established with 320 apple trees of cultivar 'Gala' at the Simcoe site to carry out the black rot efficacy trial in 2024. The results of both efficacy trials will provide more tools for Ontario growers to manage these diseases.

The project is funded by the Ontario Agri-Food and Innovation Alliance with support from the Ontario Apple Growers.

Harvest Quality Vision (HQV) and Streamlined Connectivity Tech for Ontario Fruit Trees – Matt Deir, Jeff Chemeres, Liz Turner, Reid Mitchener (Dragonfly IT), Kathryn Carter, Wendy McFadden-Smith, Erika DeBrouwer, and Kristy Grigg-McGuffin (OMAFRA)

Ontario Apple Growers (OAG) and the Ontario Tender Fruit Growers partnered with DragonFly IT to research, pilot, and demonstrate 3 new Croptracker features that have the potential to greatly improve harvest efficiency, inventory management, production quality, promotion planning, marketability, and sales of tree fruit in Ontario. Objectives include:

1) Scanning Trees with Crop Load Vision (CLV)

The project formulated industry requirement specifications in Ontario for crop load detection, conduct dual process crop load estimate tests, further develop, and optimize Harvest Quality Vision (HQV) technology to scan trees for crop load based on established specific requirements and conduct validity/accuracy tests. HQV technology will be further developed, based on Ontario industry requirements, to detect the number and size of fruit production on trees.

2) Scanning Fruit for Harvest Quality Vision (HQV)

The project used industry requirement specs in Ontario for crop defect detection in the bin, further develop and optimize HQV technology to scan for fruit defects based on established specification requirements and conduct validity/accuracy tests. HQV technology will not only detect size and colour with a high degree of accuracy; but incorporates artificial intelligence to identify defects on fruit in the bin, providing growers with reports and statistics on the number of defects on picked fruit in bins prior to packing.

3) Seamless Internet Connectivity - "Off-line Mode"

The project used industry requirement specs in Ontario to establish which key modules require the "off-line mode" feature, develop the off-line mode feature based on established specs and test the processing and accuracy of data flow using this new feature. Key modules now see an improvement in "ease of use", efficiency gained and in accessibility for all users.

The OAG would like to sincerely thank and acknowledge the assistance of OMAFRA staff Kathryn Carter, Erika DeBrouwer, Wendy McFadden-Smith, and Kristy Grigg-McGuffin, for providing many hours of technical support and expertise to this project as well as their summer students. The OAG also thanks the many Ontario apple growers and packers who provided their time, knowledge, and valuable information to this project. This project is now completed.

Canadian Tree Fruit Products Development – Erin Wallich, and Graham Karner, Summerland Varieties Corporation, Erika DeBrouwer, OMAFRA, Leslie Huffman, and Maureen Balsillie

The Grower Testing project is led by the British Columbia Fruit Growers' Association (BCFGA) in partnership with Ontario Apple Growers (OAG), Summerland Varieties Corp. (SVC), Scotian Gold and the Québec-based consortium, Le réseau d'essai de cultivars et de porte-greffes de pommiers (RECUPOM).

The partners work with the apple breeding staff at Agriculture and Agri-Food Canada's Summerland Research and Development Centre (Summerland RDC) in Summerland, BC to test promising new apple selections under a range of growing conditions. The project is now completed. Funding was provided by the Agri-Science Program and ended March 31, 2023.

For more than 10 years, 10 grower-cooperators across the province planted advanced selections of apple breeder's selections to evaluate for suitability for various climatic regions and markets in Ontario. Each cooperator was provided with the trees and asked to plant a supported system. The OAG Cultivar Technician visits each of the cooperator sites twice a year (bloom time and harvest time) to take measurements, photos and make observations. The OAG would like to thank our cooperators for the time and expertise that they have provided to this project.

Summerland Varieties Corporation has applied for another 5 years of funding from the Sustainable Canadian Agricultural Program (S-CAP) with the OAG as a partner. The project proposal is currently under review.

2023 Apple Breeding Program Update – Rachael LeBlanc, Vineland Research and Innovation Centre



From the orchard

Like most of Ontario, Vineland had an excellent growing season in 2023. Approximately 7,000 of our 17,000 trees were fruiting this year and were evaluated in-field for consumer preference. Highlights this year:

- 2,650 trees were added to the Test 1 orchard on the Vineland research farm
- 14 genotypes were advanced to Test 2, bringing the total number of cultivars in Test 2 to 107
- Test 3 trialing network was expanded:
    - Up to eight selections have been planted at 11 sites in Ontario, three sites in Quebec and two sites in Nova Scotia
    - Additional selections were propagated and will be available for grower plantings in the spring of 2024

- Preliminary controlled atmosphere (CA) storage performance was evaluated for 16 selections:
    - Consumer-preferred texture was maintained during storage for some advanced selections
    - Additional experiments will be performed in 2023-2024
- 16 crosses were made with a focus on consumer-preferred flavour and texture; seeds are currently being extracted in preparation for stratification and genotyping

Over the next five years, Vineland plans to validate and deploy a more advanced method of predictive pre-screening of material for complex traits, such as tolerance to fire blight and scab, called genomic selection. It will bring further efficiencies to our breeding program and help to develop successful varieties for apple producers.

Sensory profiles and consumer liking

Each year, fruit from up to 25 trees in the T2 block is profiled by Vineland's trained sensory panel and described for aroma, flavour, taste, and texture characteristics. Apples are grouped based on flavour profile due to differences in characteristics such as high versus low sweet and crisp, juicy versus soft or mealy textures. Data from the trained sensory panel is used to predict consumer liking of Vineland's selections. This data is critical to ensure our breeding program is continuing to advance apples with high consumer appeal.

Looking forward

To help support our apple breeding program, Vineland has applied for the Sustainable Canadian Agricultural Partnership, a five-year agreement among federal, provincial, and territorial governments. The objective is to develop consumer-preferred Canadian apple varieties that contribute to climate change mitigation. The proposed reduction in greenhouse gas (GHG) emissions comes from a range of strategic measures that include replacing imported apples with Canadian-adapted varieties to cut down on transportation-related GHGs, developing disease-resistant varieties to minimize the use of high-input production practices and their associated emissions, increasing carbon sequestration, and enhancing storability of the variety to reduce methane emissions from food waste. Vineland has expanded its capabilities to offer support to a wide range of horticultural farms in establishing a foundation for environmental impact, encompassing aspects like greenhouse gas emissions, water usage and energy consumption. For example, Vineland has the capacity to perform a life-cycle assessment study for an apple variety, to estimate its environmental footprint using the standard life-cycle inventory and compare it with other available varieties in the market. With their expertise on sustainability assessment in horticulture, we can quantify and evaluate the proposed GHG mitigation potential of a variety or technology, supported by a comprehensive understanding of science-based targets, industry standard methodologies and updated emission factors.

Commercial pipeline and partnerships

Vineland recently announced a new collaboration with the Associated International Group of Nurseries (AIGN). This partnership will advance apple variety development in our breeding program by combining Vineland's multi-disciplinary research and innovation capabilities and intellectual property management skills with AIGN's expertise in tree production and commercialization. AIGN will work closely with Vineland and contribute to the evaluation, selection, and commercialization of new apple cultivars for Canadian consumers and beyond.

This research is supported by Ontario Apple Growers through the Agriculture and Agri-Food Canada AgriScience Program and through the Ontario Ministry of Agriculture, Food and Rural Affairs-University of Guelph Partnership Program.

Impact of climate change on insects: OBLR and heat waves - Shelley Adamo, Dalhousie University, Suzanne Blatt, AAFC, Laura McMillan, Dalhousie University, Russell Easy, Acadia University, Raymond Spiteri, University of Saskatchewan

Canada is experiencing an increase in the number, frequency, and duration of heat waves during the growing season. In response, insects in the more northern part of their range may need to engage in behaviors to thermo-regulate. Such behaviors can include increased movement within their habitat, altering where they forage for food and these changes may increase their potential for predation or desiccation. Some studies have demonstrated that some insects can become more susceptible to pesticides. Using the oblique-banded leafroller (OBLR) as a model insect, the project has the following objectives:

1. To observe OBLR instars on apple trees during heat waves for any thermo-regulation behaviors
2. Using incubators, evaluate the impact of heat waves on 3rd instar OBLR development, survival, and response at the molecular level (immune and detoxification pathways)
3. Using incubators, evaluate the impact of heat waves on OBLR development, survival, and response at the molecular level (immune and detoxification pathways) when exposed to pesticides (heat wave exposure to occur before, during and after the pesticide application, and pesticides to be applied at 5 different rates). Pesticides to be studied: DiPel (Bt), Altacor and Confirm.
4. Validate laboratory observations by applying products to caged OBLR on apple trees during heat waves
5. Develop an App to guide growers on what rate and when to apply these products in relation to heat waves for best efficacy

Research progress to date:

Objective 1 – during 2023, using potted apple trees in a portable greenhouse, OBLR was observed across a range of temperatures and a thermo-couple was used to record the experienced temperature inside the silken tents created by the larvae. Results suggest that OBLR can reduce their exposure to heat inside the silken tents. A significant issue with these trials is the greenhouse material which is altering the amount of radiation experienced by the larvae in these trials. Further studies are planned for 2024 to confirm the results obtained in 2023.

Objectives 2 and 3 - Whole organism studies: throughout 2023, incubator trials on 3rd instar OBLR were completed and analyzed. A confounding factor for the application of the pesticides was instar stage of the OBLR. Heat wave advanced the instar stage more rapidly than anticipated. A second set of incubator trials using 2nd instar OBLR was conducted to account for the advanced development of the larvae. Following the completion of the 2nd instar experiments, analysis suggests a significant impact of heat wave on pesticide efficacy when applied prior to the heat and during the heat wave. Once larvae have experienced a heat wave, pesticide efficacy decreases. The most efficacious time to apply pesticides is before a heat wave or shortly into a heat wave. Based upon the results obtained during these studies, Phase II (dose response) was initiated. For these studies, 2^{nd,} and 3rd instar OBLR were used but only at 2 timings: during the

heat wave and following a heat wave as these are representative of the situations that growers are likely to face in the field. Four doses were used (full rate, ¾ rate, ½ rate and ¼ rate) to determine if heat wave exposure impacts the dose response curve. Upon completion, the data from these studies will be used to develop the App (Objective 5).

Molecular studies: these are still in the preliminary phase. Transcriptome analysis is expensive and only a few samples will be sent. A decision regarding which instar stage and heat wave exposure timing will be sent for this work is pending.

Objective 4 – during 2023 there was no progress on this objective as further work on Objectives 1-3 was the focus during 2023.

Objective 5 – this objective has not been initiated yet, pending completion of the Phase II experiments.

Optimized Multi-Task Netting Systems for Next Generation Orchards – Mikael Larose, IRDA
The aim of this initiative is to assist the Canadian apple industry in addressing labour and pesticide-related issues. Through the implementation of exclusion netting, narrow fruit walls, and mechanized processes, the goal is to establish a comprehensive precision farming system that enables the cultivation of top-quality fruits, minimizes pesticide usage, and provides protection against climate-related challenges such as hail and exotic pests.

Data collected since 2019 provides insights into the impact of netting on insect intrusion, fruit damage, fruit quality, yield, and climatic conditions. The use of netting has a positive effect by reducing the presence of the codling moth, apple maggot, and the incidence of flyspeck. Additionally, exclusion nets do not seem to affect the colour, size, or sugar content of the fruits while maintaining stable temperature and relative humidity levels. Currently, the yield is not influenced by the number of tree leaders, but there is a delay in overall growth due to the growing process, resulting in a lag in the development of two-leader and four-leader trees compared to single-leader trees. Data has been acquired to measure the effects of mechanical pruning on apple trees trained in a narrow fruiting wall. However, this data has not been analyzed yet.
The activities conducted in 2022 involved the development of a mechanically operated opening/closing system to decrease labour costs associated with net manipulation. The prototype has been successful, and an ongoing project aims to optimize and commercialize this system.

Project partners along with the Ontario Apple Growers include Agriculture Agri-Food Canada, British Columbia Fruit Growers Association, New Brunswick Fruit Growers, Nova Scotia Fruit Growers Association, Les Producteurs de Pommes du Quebec, Imaflex Inc., and Artes Politecnica.

Canadian Agri-Science Cluster for Horticulture 3
The following two industry-driven projects, which were common throughout the collaborating provinces, are being investigated with funding from the Canadian Agri-Science Cluster for Horticulture 3 with total funding of $1.3 million over 5 years (2018 to 2023). These projects are generously funded through the Canadian Agri-Science Cluster for Horticulture 3, in cooperation with Agriculture and Agri-Food Canada's AgriScience Program, a Canadian Agricultural Partnership initiative, Fruit and Vegetable Growers of Canada and industry contributors. The OAG

would also like to recognize and thank the Apple Marketers' Association of Ontario (AMAO) for their funding contribution.

On October 10th, 2023, Minister Lawrence MacAulay, Agriculture and Agri-Food Canada, announced a five-year federal investment of $9.8 million to the Canadian AgriScience Cluster for Horticulture 4. Cluster 4, led by the Fruit and Vegetable Growers of Canada (FVGC), will include an additional $7.7 million in contributions from industry, for a total investment of $17.5 million. The Canadian AgriScience Cluster for Horticulture 4 focuses on innovation, competitiveness, and sustainability to ensure Canadian fruit and vegetable growers have the tools and resources they need to continue to grow high-quality, healthy fruits and vegetables for Canadians and the world.

Two apple sector driven projects are included in Cluster 4:

1. Reducing losses from apple pests with alternative control strategies - Suzanne Blatt (AAFC)
2. Apple crop load management: Enhancing thinning predictability and tree response through advancements in modeling, new precision thinning products and strategies, and technology - J. Cline (U of G)

Optimizing Storage and Postharvest Practices to Reduce Apple Loss and Improve Quality – Dr. Jennifer DeEll, OMAFRA

Final report 2018 - 2023

Objective 1. Optimize postharvest practices and storage regimes for rising cultivars

1.1. 'Honeycrisp' – Postharvest Treatments

Temperature conditioning for 1 week at 10°C after harvest (then 3°C) and delaying controlled atmosphere (CA, 3% O_2 + 1.5% CO_2) storage for 1 month, in combination with or without postharvest 1-methylcyclopropene (1-MCP, SmartFresh™ (AgroFresh, Inc.)) were evaluated in 'Honeycrisp' apples for a second season. 1-MCP significantly reduced greasiness and ethylene production, slowed ground color change from green to yellow, and improved acidity retention. 1-MCP also reduced internal browning, but increased the incidence of peel blotch, ultimately having no overall effect on total disorders.

1.2. 'Gala' – CO_2 Concentration

Two 'Gala' apple orchards were sprayed with 1/4 and 1/3 label rates of ReTain (AVG), 4 and 2 weeks prior to harvest, respectively. Harvista™ (1-MCP) was then sprayed 8 days prior to harvest, at a rate of 60 g/ acre. All sprays are known to increase CO_2 injury during storage. Apples from each orchard were treated with postharvest 1-MCP (SmartFresh™) at harvest time or after storage, or not treated as controls. CA storage with 1.6% O_2 + 1.5, 1 or 0.5% CO_2 at 0.5°C was established 2 days after harvest, and O_2 concentration for all apples was reduced to 0.6% after 11 days. Apples were evaluated for quality after 8 months of storage, plus 1, 7 and 14 days at room temperature. 'Gala' held in 1.5% CO_2 had significantly more stem-end and internal browning, compared to those held in lower CO_2 regimes (45 vs 30-31%, respectively). There were no significant differences in disorders between apples stored in 1 or 0.5% CO_2. 1-MCP had no significant effect on stem-end and internal browning. There was a large difference between orchards however, with 50 vs 19% incidence of disorders.

1.3. 'Gala' – Pre and Postharvest 1-MCP

'Gala' from the same orchards and sprayed the same as above but with and without preharvest 1-MCP (Harvista) were treated with postharvest 1-MCP (SmartFresh™) at harvest time or after

storage, or not treated as controls. CA storage with 1.5% O_2 + 1.5% CO_2 at 0.5°C was established 3 days after harvest. Apples were evaluated for quality after 6 and 8 months of storage, plus 1, 7 and 14 days at room temperature. 'Gala' that were sprayed preharvest with 1-MCP had significantly less stem-end and internal browning, compared to those not sprayed (48 vs 82%, respectively). Postharvest treatment with 1-MCP had no significant effect on stem-end and internal browning, regardless of treatment timing. As expected, 1-MCP significantly improved fruit firmness retention and this effect was found for both preharvest spray and postharvest treatment. There was also an additive effect, as 'Gala' treated with both pre- and postharvest 1-MCP were significantly firmer than apples from all other treatment combinations (+2 lb.).

Similar 'Gala' apples were also harvested 2 weeks later, treated with and without postharvest 1-MCP at harvest time, held in ambient air storage at 0.5°C for 4 months. 'Gala' that were sprayed preharvest with 1-MCP had significantly less stem-end and internal browning, compared to those not sprayed (20 vs 34%, respectively). In contrast, postharvest treatment with 1-MCP resulted in higher incidence of browning disorders compared to no postharvest treatment (46 vs 8%, respectively). There was a significant interaction of pre- and postharvest 1-MCP, with the highest incidence (71%) of stem-end and internal browning in apples not sprayed preharvest with 1-MCP but treated postharvest with 1-MCP, and the lowest incidence (10%) in those that did not receive any 1-MCP treatment. As expected, 1-MCP significantly improved fruit firmness retention and this effect was found for both preharvest spray and postharvest treatment. There was also an additive effect, as 'Gala' treated with both pre- and postharvest 1-MCP were significantly firmer than apples from all other treatment combinations (+2.5 lb.).

1.4 'Ambrosia' – Maturity and Storage

'Ambrosia' apples from two orchards were harvested twice, 6 days apart. All apples were cooled overnight to 0.5°C and treated with (1-MCP, SmartFresh™) the following day. CA storage was established 4 days after harvest, as 1.7% O_2 + 1.2% CO_2 at 0.5°C. Apples were evaluated for quality after 8 months of storage, plus 1, 7 and 14 days at room temperature. 'Ambrosia' from the first harvest had significantly less stem-end and internal browning, compared to those from the later harvest (31 vs 63%, respectively). This is very important to note, as harvesting only 6 days later resulted in over double the amount of browning. There was also a large difference between orchards, with 58 vs 37% incidence of browning. As expected, apples from the first harvest were firmer than those from the later harvest (+ ~2 lb.).

Similar 'Ambrosia' apples were also stored in ambient air storage at 0.5°C for 4 months. 'Ambrosia' from the first harvest had significantly less stem-end and internal browning, compared to those from the later harvest (8 vs 37%, respectively). The was also a large difference between orchards, with 28 vs 15% incidence of browning. As expected, apples from the first harvest were firmer than those from the later harvest (+ ~1 lb.).

Objective 2. Evaluate new low oxygen storage and dynamic regimes to reduce apple loss

2.1. 'Honeycrisp' – SafePod™ Technology, ~1% O_2

'Honeycrisp' apples were transported to the *Apple Storage Research Facility* in Simcoe, ON within 4 days of harvest, during which time the temperature was ~3°C. All apples were then held at 10°C for 1 week and subsequent air storage at 3°C for ~3 weeks. One month after harvest, apples were transferred to CA storage at 3°C and 0.5°C. Low oxygen at 0.8% (with <1% CO_2) was established slowly over several months after initial rapid oxygen reduction to 3%, based on fruit respiration measurements using dynamic SafePod™ technology (Storage Control Systems, Inc.). After 8 months, apples were removed from storage and treated with or without 1-MCP (SmartFresh™),

and evaluated for quality after 1, 7 and 14 days at room temperature. 'Honeycrisp' developed more soft scald at 0.5°C than 3°C (8 vs 1%, respectively), and there was no significant effect of 1-MCP on its incidence. Apples exhibited lower respiration rates during storage 0.5°C, compared to 3°C. 1-MCP reduced greasiness incidence and severity during 14 days at room temperature. There were no significant differences in other quality attributes.

2.2. 'Cortland' – low oxygen

'Cortland' apples were transported to the *Apple Storage Research Facility* in Simcoe, ON within 3 days of harvest, during which time the temperature was ~3°C. Apples were then stored at 0.5°C and CA established as 2.5% O_2 + 2% CO_2 or 1.5% O_2 + 1% CO_2. Apples were treated with postharvest 1-MCP (SmartFresh™) upon arrival at the lab or after 8½ months of storage, or not treated as controls. Fruit quality evaluations were made after an additional 1 and 8 days at room temperature. 'Cortland' from the lower oxygen regime with 1.5% O_2 developed significantly less superficial scald compared to apples stored in 2.5% O_2 (51 vs 70%). 1-MCP treatment upon arrival at the lab (4 days from harvest) also reduced superficial scald development, compared to those not treated or with 1-MCP after storage (36 vs 71 and 76%, respectively). The earlier 1-MCP treatment also reduced ethylene production and improved firmness and acidity retention during storage.

Objective 3. Investigate new technology for harvest management and fruit maturity

3.1. I_{AD} readings from DA meter

Index of Absorbance Difference (I_{AD}) data were analyzed for four major apple cultivars ('Honeycrisp', 'Ambrosia', 'Gala' and 'McIntosh') from 4 or more years during harvest time, as well as I_{AD} relationships with fruit firmness, internal ethylene concentration, and starch index values. I_{AD} values differed among the four cultivars, with 'McIntosh' showing the highest I_{AD} overall and 'Gala' having the lowest (1.17 and 0.33, respectively). Principal component analysis showed that the cultivars were separated into distinct groups. 'Honeycrisp' was clustered with starch and ethylene, while 'Gala' and 'McIntosh' were mainly clustered with firmness and I_{AD}, respectively. Correlations between I_{AD} and other maturity indices were very variable over the years. In conclusion, I_{AD} may relate to harvest maturity, but it did not correlate closely or consistently with other maturity indices, varied greatly year-to-year, and was cultivar dependent. A scientific paper from this work is pending publication.

Project Conclusions

- Specific postharvest treatments can have both positive and negative effects on disorders, and therefore a compromised approach to storage is needed.
- Orchard block is a strong factor in the development of postharvest storage disorders.
- Harvesting only 6 days later than optimum can over double the amount of internal browning.
- Ultra-low O_2 (<1%) storage is very effective at reducing internal browning, but minimum safe gas levels vary with cultivar and growing season.
- Pre-harvest 1-MCP orchard spray reduces internal browning and improves quality retention, but efficacy is very dependent on rate and application timing.
- DA meter (I_{AD} measurements) should not be used alone to judge apple maturity and I_{AD} standards are not consistent year-to-year or among regions, orchards, and harvest times.

Sustainable Control Practices for Apple Pests in Canada - Suzanne Blatt, Jean-Philippe Parent, Justin Renkema and Gaetan Bourgeois (AAFC), Michelle Cortens (Perennia), Joanne Driscoll (PEI Hort Association), Hannah Fraser and Kristy Grigg-McGuffin (OMAFRA), Susannah Acheampong and Tracy Hueppelsheuser (BCMA), Daniel Cormier and Gerald Chouinard (IRDA)

Common insect pests of concern across all five main apple-growing provinces (Ontario, Quebec, British Columbia, Nova Scotia, and New Brunswick) include: apple maggot, apple leaf curling midge and leafrollers such as eye spotted budmoth and oblique-banded leaf roller. For the apple industry to remain competitive, it is critical that these pests be managed to facilitate export of high-quality apple cultivars. Restrictions on use and deregistration of some pesticides are driving the need for alternative and effective management strategies for many of these species.

Objectives of this project are to:

1. Develop improved control methods for apple maggot through determination of the number of sprays required to effect control with currently available products,
2. Further understanding of apple leaf-curling midge phenology and refine a recently developed degree day model, and
3. Investigate the utility of host volatiles for mass capture of multiple species of leafroller.

Recent progress:

Objective 1 – this objective was completed in 2019.

Objective 2 – a Fact Sheet was developed and is available in both French and English. These were shared with collaborators during 2023 to disseminate to growers and interested stakeholders.

Objective 3 – the final year of experiments occurred in 2022. Analysis of the entire data suggests a regional response of various species to the host volatiles. A manuscript is being prepared detailing all the results of this trial. Results from this work indicate that host volatiles show some benefit on Quebec populations of codling moth and eye-spotted budmoth, with little to no effect observed in Ontario. In all areas host volatiles were less effective than pheromones. Use of host volatiles for mass trapping showed similar results in 2022 for both BC and NS; damage reduction was approximately 3%, which is not enough of an improvement to warrant using these for mass trapping.

This project officially ended in March 2023.

Acknowledgements

The Ontario Apple Growers acknowledges and thanks the support of our many funding partners, including the Apple Marketers' Association of Ontario, Hort Crops Ontario, and Ontario Fruit & Vegetable Growers Association. Canadian Agriculture Partnership is a federal-provincial-territorial initiative.

NATIONAL REPORTS

CANADAGAP REPORT

Apple growers, packers and wholesalers across Canada have been active participants in the CanadaGAP® food safety program since 2009. In Ontario, more than 100 apple growers, packers and storage operators are CanadaGAP-certified.

2023 Achievements:

- Thanks to AAFC funding secured in partnership with the Fruit and Vegetable Growers of Canada (FVGC), CanadaGAP successfully completed a scope expansion of the Greenhouse Food Safety program. Certification became available on April 1, 2023, to additional greenhouse-grown crops, such as melons, berries, various root vegetables, cruciferous crops, and legumes.
- More course offerings and greater promotion of Understanding the CanadaGAP Program introductory course.
- Additional tools were made available on CanadaGAP website:
    - Updated FAQs published at www.canadagap.ca
    - Updated and new brochures and PowerPoint presentations (topics include unannounced audits, new certification options, main changes to manuals)
- Over the last two years, CanadaGAP worked closely with an affiliate of the program, Provision Analytics, which is a third-party software provider that invested in fully digitizing the CanadaGAP Food Safety Manuals.

Certification Body Changes:

- There has been unprecedented turnover in certification bodies and auditors since the beginning of the pandemic.
- Three certification bodies joined CanadaGAP and became active service providers in 2023:
    - Control Union
    - dicentra
    - TSLC
- Some certification bodies have seen significant staff turnover during the pandemic. Perry Johnson Registrars Food Safety, Inc. joined the program as a service provider in 2020 and decided to stop providing CanadaGAP audits in 2023.
- The largest certification body for CanadaGAP, NSF Canada Ag, has experienced significant service challenges in the last year.
- Additional audit companies have approached CanadaGAP and are under consideration for licensing.

Enhanced efforts to recognize and attract new auditors:

- CanadaGAP has been working closely with certification bodies to identify potential sources of new auditor candidates.
- Delivery of CanadaGAP Auditor Training program has gone fully virtual and offers increased flexibility in dates. A new group of auditor trainers was qualified. CanadaGAP introduced in-house exam proctoring on Zoom.

What's Ahead for 2024:

- Maintenance of Canadian Government Recognition: 5-year review begins in the last quarter of 2023.
- Re-benchmarking the next version of GFSI Requirements in 2024-2025.
- Correction Notice will be issued for manuals (Version 10.0) in 2024 but no new version will be released.
- CanadaGAP will publish an updated Audit Checklist for 2024.

APPENDIX

ONTARIO APPLE GROWERS 2023 APPLE YIELD REPORT BY VARIETY						
Variety	**2022 Production ('000 lbs)**	**2023 Production ('000 lbs)**	**2023 Production ('000 bushels)**	**% Change 2023 vs. 2022**	**5-Year Average (2018 - 2022) Production ('000 lbs)**	**% change 2023 vs. 5-year average**
Other Early Varieties	8,934	8,276	197	-7.4%	8,755	-5.5%
Ambrosia	41,146	47,773	1,137	16.1%	28,827	65.7%
Cortland	9,693	8,401	200	-13.3%	10,994	-23.6%
Crispin/Mutsu	1,560	1,270	30	-18.6%	2,151	-41.0%
Empire	23,778	18,603	443	-21.8%	29,290	-36.5%
Fuji	10,165	10,555	251	3.8%	6,676	58.1%
Gala	90,094	90,155	2,147	0.1%	69,120	30.4%
Golden Delicious	10,085	11,480	273	13.8%	9,460	21.3%
Honeycrisp	56,104	60,467	1,440	7.8%	40,221	50.3%
Idared	7,280	6,280	150	-13.7%	5,155	21.8%
McIntosh	41,818	33,968	809	-18.8%	48,161	-29.5%
Northern Spy	18,257	21,014	500	15.1%	25,893	-18.8%
Red Delicious	24,343	22,830	544	-6.2%	25,550	-10.6%
Spartan	2,896	1,918	46	-33.7%	4,072	-52.9%
Other Late Varieties	17,817	22,619	539	26.9%	14,292	58.3%
Total Fresh	**363,970**	**365,610**	**8,705**	**0.5%**	**328,618**	**11.3%**

Source: OAG Yield Survey

Ontario Apple Tree Acreage By Variety, By District

Variety Name	1 Western	2 Central West	3 Northern	4 Central	5 Eastern	Total Acreage	2022 % of Total Acreage	2021 % of Total Acreage
Gala	590	762	245	405	857	2,859	18.1%	17.2%
Honeycrisp	316	393	492	326	767	2,294	14.5%	14.1%
McIntosh	146	536	993	134	349	2,157	13.6%	14.3%
Ambrosia	418	341	298	265	328	1,651	10.4%	10.2%
Red Delicious	253	338	64	120	250	1,025	6.5%	7.2%
Northern Spy	55	259	623	26	27	990	6.3%	6.4%
Empire	212	406	151	47	112	928	5.9%	6.5%
Golden Delicious	230	96	7	97	74	504	3.2%	3.4%
Cortland	38	82	133	68	94	415	2.6%	2.7%
Idared	57	79	225	12	29	402	2.5%	2.6%
Fuji	150	87	15	40	74	367	2.3%	2.1%
Crispin/Mutsu	67	50	18	76	14	225	1.4%	1.5%
Paulared	40	37	33	22	85	217	1.4%	1.4%
Spartan	3	26	134	16	15	194	1.2%	1.3%
Ginger Gold	58	29	11	23	57	177	1.1%	1.0%
Crimson Crisp	23	5	73	37	16	155	1.0%	0.9%
*Other Cultivars	221	133	400	173	349	1,275	8.1%	7.1%
TOTAL	**2,878**	**3,659**	**3,916**	**1,887**	**3,496**	**15,835**	**100%**	**100%**
	18.2%	**23.1%**	**24.7%**	**11.9%**	**22.1%**	**100.0%**		

Notes: Includes bearing and non-bearing acreage in Ontario.

Sources: Agricorp/OAG ADaMS DMS System and Statistics Canada Table: 32-10-0364-01

See Ontario Apple Growing Regions section in this annual report for a more detailed description of Districts 1 to 5 above.

*Other Cultivars include: Aurora Golden Gala, Braeburn, Cameo, Cox's Orange Pippin, Creston, Cripps Pink, Dabinett, Earligold, Eden, Elstar, Fortune, Golden Russet, Goldrush, Granny Smith, Jerseymac, Jonagold, Jonamac, Kingston Black, Liberty, Lobo, Lodi, Macoun, Marshall Mac, Mascad De Dieppe, Melba, Michelin, Nicola, Novaspy, Porter's Perfection, Quinte, RAVE, Red Prince, Rome, Roxbury Russet, Russet, Salish, Shizuka, Silken, Smitten, Snow, Snowflake, Sunrise, Sweet Coppin, Tolman Sweet, Transparent, Tydeman Red, Viking, Vista Bella, Wealthy, Winesap, Yarlington Mill and Zestar!.

Ontario Apple Tree Acreage By Variety, By Tree Age

Variety Name	1 To 5 Years (2018-2022)	6 To 10 Years (2013-2017)	11 To 15 Years (2008-2012)	16 To 20 Years (2003-2007)	21 To 30 Years (1993-2002)	31 Years and Over (Pre-1993)	Total Acreage	% of Total Acreage
Gala	765	873	660	213	295	54	2,859	18.1%
Honeycrisp	770	660	451	297	114	2	2,294	14.5%
McIntosh	36	132	200	166	265	1,358	2,157	13.6%
Ambrosia	611	544	273	208	14	1	1,651	10.4%
Red Delicious	78	239	93	18	197	400	1,025	6.5%
Northern Spy	2	7	68	47	212	654	990	6.3%
Empire	7	19	54	50	221	577	928	5.9%
Golden Delicious	20	20	136	48	167	113	504	3.2%
Cortland	45	62	76	30	71	132	415	2.6%
Idared	2	24	4	10	26	336	402	2.5%
Fuji	162	93	44	13	42	12	367	2.3%
Crispin/Mutsu	5	12	29	28	79	73	225	1.4%
Paulared	20	58	32	5	14	89	217	1.4%
Spartan	0	4	5	3	38	144	194	1.2%
Ginger Gold	47	29	26	11	61	3	177	1.1%
Crimson Crisp	61	88	5	-	0	-	155	1.0%
*Other Cultivars	415	170	89	231	146	223	1,275	8.1%
TOTAL	**3,047**	**3,034**	**2,246**	**1,378**	**1,961**	**4,170**	**15,835**	**100.0%**

Notes: Includes bearing and non-bearing acreage in Ontario.

Sources: Agricorp/OAG ADaMS DMS System and Statistics Canada Table: 32-10-0364-01

*Other Cultivars include: Aurora Golden Gala, Braeburn, Cameo, Cox's Orange Pippin, Creston, Cripps Pink, Dabinett, Earligold, Eden, Elstar, Fortune, Golden Russet, Goldrush, Granny Smith, Jerseymac, Jonagold, Jonamac, Kingston Black, Liberty, Lobo, Lodi, Macoun, Marshall Mac, Mascad De Dieppe, Melba, Michelin, Nicola, Novaspy, Porter's Perfection, Quinte, RAVE, Red Prince, Rome, Roxbury Russet, Russet, Salish, Shizuka, Silken, Smitten, Snow, Snowflake, Sunrise, Sweet Coppin, Tolman Sweet, Transparent, Tydeman Red, Viking, Vista Bella, Wealthy, Winesap, Yarlington Mill and Zestar!.

2022 ONTARIO APPLE PRODUCTION BY UTILIZATION

PRODUCTION (LBS.)

Variety	Fresh		Juice Processing		Other Processing		Total	
	2022	2021	**2022**	2021	**2022**	2021	**2022**	2021
Ambrosia	**39,776,628**	29,337,968			**1,369,000**	4,893,004	**41,145,628**	34,230,972
Cortland	**9,506,790**	7,208,753			**186,272**	703,950	**9,693,062**	7,912,703
Crispin (Mutsu)	**599,534**	82,309			**960,455**	1,006,500	**1,559,989**	1,088,809
Early Varieties	**8,713,429**	7,182,659			**220,099**	56,829	**8,933,528**	7,239,488
Empire	**20,247,621**	20,215,264			**3,530,190**	2,626,053	**23,777,811**	22,841,317
Fuji	**10,161,918**	6,358,926			**3,000**	368,353	**10,164,918**	6,727,279
Gala	**88,618,366**	70,297,852			**1,475,177**	308,373	**90,093,543**	70,606,225
Golden Delicious	**9,827,877**	9,036,666			**257,570**	75,121	**10,085,447**	9,111,787
Honeycrisp	**55,483,776**	34,359,940			**619,976**	186,706	**56,103,752**	34,546,646
Idared	**0**	0			**7,280,176**	4,458,559	**7,280,176**	4,458,559
McIntosh	**26,665,113**	26,750,171			**15,152,852**	7,724,656	**41,817,965**	34,474,827
Northern Spy	**0**	0			**18,257,335**	14,707,865	**18,257,335**	14,707,865
Red Delicious	**23,245,140**	21,575,978			**1,098,090**	1,005,868	**24,343,230**	22,581,846
Spartan	**1,782,636**	2,166,351			**1,113,020**	351,610	**2,895,655**	2,517,961
Other Varieties	**16,060,824**	6,560,649			**1,756,671**	2,238,114	**17,817,495**	8,798,763
Mixed Varieties - Juice	**-**	-	**21,925,533**	16,230,150	**-**	-	**21,925,533**	16,230,150
Total	**310,689,651**	241,133,486	**21,925,533**	16,230,150	**53,279,883**	40,711,561	**385,895,067**	298,075,197

Source: 2022 OAG Marketing Report

2022 ONTARIO APPLE GROWER PRICE PER LB.

GROWER PRICE ($/LB)

Variety	Net Return/ 840 Lb. Bin	Fresh		Juice Processing		Other Processing		Average Combined Fresh and Other Processing	
	2022	2022	2021	2022	2021	2022	2021	2022	2021
Ambrosia	**$ 298**	**$ 0.36**	$ 0.34			**$ 0.20**	$ 0.22	**$ 0.35**	$ 0.33
Cortland	**$ 224**	**$ 0.27**	$ 0.28			**$ 0.22**	$ 0.20	**$ 0.27**	$ 0.27
Crispin (Mutsu)	**$ 248**	**$ 0.30**	$ 0.28			**$ 0.21**	$ 0.16	**$ 0.24**	$ 0.17
Early Varieties	**$ 293**	**$ 0.35**	$ 0.34			**$ 0.25**	$ 0.21	**$ 0.35**	$ 0.34
Empire	**$ 174**	**$ 0.21**	$ 0.22			**$ 0.22**	$ 0.22	**$ 0.21**	$ 0.22
Fuji	**$ 298**	**$ 0.35**	$ 0.35			**$ 0.18**	$ 0.22	**$ 0.35**	$ 0.34
Gala	**$ 326**	**$ 0.39**	$ 0.37			**$ 0.22**	$ 0.23	**$ 0.39**	$ 0.37
Golden Delicious	**$ 276**	**$ 0.33**	$ 0.33			**$ 0.22**	$ 0.21	**$ 0.33**	$ 0.33
Honeycrisp	**$ 624**	**$ 0.74**	$ 0.77			**$ 0.20**	$ 0.23	**$ 0.74**	$ 0.76
Idared	**$ -**	**$ -**	$ -			**$ 0.29**	$ 0.18	**$ 0.29**	$ 0.18
McIntosh	**$ 198**	**$ 0.24**	$ 0.25			**$ 0.20**	$ 0.20	**$ 0.22**	$ 0.24
Northern Spy	**$ -**	**$ -**	$ -			**$ 0.30**	$ 0.27	**$ 0.30**	$ 0.27
Red Delicious	**$ 256**	**$ 0.30**	$ 0.25			**$ 0.19**	$ 0.22	**$ 0.30**	$ 0.25
Spartan	**$ 270**	**$ 0.32**	$ 0.33			**$ 0.30**	$ 0.18	**$ 0.31**	$ 0.31
Other Varieties	**$ 339**	**$ 0.40**	$ 0.35			**$ 0.22**	$ 0.23	**$ 0.39**	$ 0.33
Mixed Varieties - Juice	**$ -**	**$ -**	$ -	**$ 0.15**	$ 0.18	**$ -**	$ -	**$ -**	$ -
Avg. Grower Price - All Utilization ($/lb)	**$ 341**	**$ 0.41**	$ 0.37	**$ 0.15**	$ 0.18	**$ 0.25**	$ 0.24	**$ 0.37**	$ 0.35
Avg. Transaction - All Utilization ($/lb)		**$ 0.48**	$ 0.43	**$ 0.15**	$ 0.18	**$ 0.27**	$ 0.26	**$ 0.43**	$ 0.39

Source: 2022 OAG Marketing Report

2022 ONTARIO APPLE GROWER VALUE

GROWER VALUE $								
Variety	**Fresh ($)**		**Orchard Juice ($)**		**Other Processing ($)**		**Total ($)**	
	2022	2021	**2022**	2021	**2022**	2021	**2022**	2021
Ambrosia	**$ 14,132,720**	$ 9,829,715			**$ 275,836**	$ 1,075,929	**$ 14,408,556**	$ 10,905,644
Cortland	**2,531,894**	1,963,113			**40,967**	140,983	**2,572,861**	2,104,096
Crispin (Mutsu)	**176,933**	22,324			**201,124**	161,212	**378,057**	183,536
Early Varieties	**3,040,106**	2,348,502			**54,112**	12,117	**3,094,218**	2,360,619
Empire	**4,194,676**	4,322,663			**760,618**	575,929	**4,955,294**	4,898,592
Fuji	**3,599,924**	2,150,747			**540**	81,106	**3,600,464**	2,231,852
Gala	**34,392,049**	25,552,112			**321,445**	71,161	**34,713,494**	25,623,274
Golden Delicious	**3,223,856**	2,906,656			**56,363**	15,927	**3,280,218**	2,922,582
Honeycrisp	**41,205,761**	25,613,411			**121,516**	43,077	**41,327,276**	25,656,488
Idared	**-**	-			**2,144,758**	799,712	**2,144,758**	799,712
McIntosh	**6,288,710**	6,439,132			**3,085,910**	1,519,702	**9,374,620**	7,958,834
Northern Spy	**-**	-			**5,402,890**	3,928,894	**5,402,890**	3,928,894
Red Delicious	**7,086,515**	5,349,231			**204,020**	221,291	**7,290,535**	5,570,522
Spartan	**572,478**	686,104			**337,632**	64,347	**910,110**	750,450
Other Varieties	**6,474,404**	2,463,693			**392,559**	387,419	**6,866,963**	2,851,112
Mixed Varieties -Juice	**-**	-	**3,220,514**	1,640,720	**-**	1,342,328	**3,220,514**	2,983,048
Total Grower Value	**$ 126,920,025**	$ 89,647,402	**$ 3,220,514**	$ 1,640,720	**$ 13,400,289**	$ 10,441,133	**$143,540,829**	$ 101,729,255
Total Transaction Value	**$ 150,110,753**	$ 100,209,042	**$ 3,220,514**	$ 1,640,720	**$ 14,525,278**	$ 12,181,639	**$167,856,545**	$ 114,031,401

Source: 2022 OAG Marketing Report

IMPORTS OF FRESH APPLES 2022 CROP YEAR (LBS)									
PROVINCE	**HONEYCRISP**	**GALA**	**GOLDEN DELICIOUS**	**GRANNY SMITH**	**IDA RED**	**MCINTOSH**	**RED DELICIOUS**	**UNSPECIFIED**	**TOTAL**
Alberta	38,334	1,272,167	8,803	290,033			446,786	1,125,414	3,181,538
British Columbia	3,641,228	37,562,598	2,084,748	13,389,909	12,145		10,974,217	67,631,015	135,295,860
Manitoba	1,239	152,692	33,329	96,875			84,671	69,697	438,503
New Brunswick	410,796	1,667					10,000	447,214	869,676
Nova Scotia	125,531	1,413,605		285,084				851,371	2,675,591
Ontario	**2,785,978**	**40,707,565**	**4,767,347**	**22,097,263**	**26,242**	**52,115**	**10,273,516**	**41,223,515**	**121,933,542**
Québec	34,363	3,958,777	234,887	3,188,244		68,797	48,815	2,851,511	10,385,394
Saskatchewan		50,834	5,880	16,316			23,514	113,181	209,726
Total By Variety	**7,037,469**	**85,119,904**	**7,134,995**	**39,363,726**	**38,387**	**120,912**	**21,861,519**	**114,312,918**	**274,989,830**
Ontario - 2021 vs. 2020	4,592,898	52,750,527	6,112,759	25,679,092	84,754	135,988	11,522,023	39,730,557	140,608,598
Ontario - 2022 vs. 2021	**-39%**	**-23%**	**-22%**	**-14%**	**-69%**	**-62%**	**-11%**	**4%**	**-13%**
Total By Variety - 2021	10,100,553	103,882,336	9,253,584	45,129,945	129,063	135,988	24,049,977	96,947,541	289,628,985
Total By Variety - 2022 vs. 2021	**-30%**	**-18%**	**-23%**	**-13%**	**-70%**	**-11%**	**-9%**	**18%**	**-5%**

IMPORTS OF FRESH APPLES - 5 YEAR AVERAGE 2018-2022 CROP YEARS (LBS)									
PROVINCE	***HONEYCRISP**	**GALA**	**GOLDEN DELICIOUS**	**GRANNY SMITH**	**IDA RED**	**MCINTOSH**	**RED DELICIOUS**	**UNSPECIFIED**	**TOTAL**
Alberta	22,914	748,624	31,280	217,917		140	162,249	515,809	1,698,932
British Columbia	2,552,109	42,637,963	3,662,216	17,702,530	34,060	9,252	13,700,089	52,019,737	132,317,955
Manitoba	6,701	133,340	26,581	80,376		46,520	63,518	70,296	427,332
New Brunswick	383,331	357,283	4,910	85,732	539,279	2,173	22,957	484,247	1,879,911
Nova Scotia	28,562	995,485		105,307	1,080,483			739,595	2,949,431
Ontario	**2,045,646**	**56,817,488**	**6,627,511**	**24,498,019**	**280,373**	**116,668**	**13,059,113**	**32,869,528**	**136,314,345**
Québec	52,936	4,706,850	503,084	5,858,016	31,087	176,861	623,643	4,302,528	16,255,006
Saskatchewan	2,287	106,548	7,404	50,890		560	13,718	181,145	362,551
Total by Variety	**5,094,486**	**106,503,580**	**10,862,985**	**48,598,787**	**1,965,281**	**352,174**	**27,645,285**	**91,182,885**	**292,205,463**
Ontario - 2022 vs. 5 Year Average	**36%**	**-28%**	**-28%**	**-10%**	**-91%**	**-55%**	**-21%**	**25%**	**-11%**
Total By Variety - 2022 vs. 5 Year Average	**38%**	**-20%**	**-34%**	**-19%**	**-98%**	**-66%**	**-21%**	**25%**	**-6%**

*Data available for full crop year starting in 2019 as a new harmonized system code for Honeycrisp was introduced part way through 2018

Note: The province denotes the port of entry and may not necessarily reflect the final provincial destination of imported apples.

Source: Statistics Canada