# 2022 Annual REPORT

ONTARIO APPLE GROWERS

October 31, 2022

# NINETEENTH ANNUAL REPORT OF THE ONTARIO APPLE GROWERS

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ONTARIO APPLE GROWERS

## 2022 BOARD OF DIRECTORS

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

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CHC Apple Working Group ● Brian Gilroy & Kelly Ciceran
Ontario Fruit & Vegetable Growers' Association ● Charles Stevens
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
*Shared Staff

# CHAIR'S REPORT

A highlight for myself and the OAG this year was our in-person summer tour in the Durham area east of Toronto, which is in District 5. We had great attendance, and everyone looked so happy to see each other. Our tour coincided with Ontario's hosting of the Fruit & Vegetable Growers of Canada (FVGC) Apple Working Group meeting which included representatives from British Columbia, Quebec, Nova Scotia, and New Brunswick. Thank you to the tour host orchards: Archibald's Orchard and Estate Winery, Algoma Orchards, and Wilmot Orchards. Thank you to our many sponsors and a very big thank you to Kristy Grigg-McGuffin and Erika DeBrouwer (OMAFRA) for their assistance with planning talks and helping to make this a very successful day.

Another positive for our sector in 2022 is our crop. The crop estimate is up 29% over last year and 19% over the five-year average. There was a scramble for enough bins to hold all the apples and storage space. For both high value varieties, Honeycrisp and Ambrosia, yields were up significantly, and this should help pay for the increased input costs we all experienced.

As far as the pandemic is concerned, I would say 2022 seemed like a "holding pattern" year. While it is no longer new, Covid is not finished with us yet. So here we are, learning to live with the virus. It's not been a straightforward time to operate a business with all the changing and inconsistent regulations. The OAG continues to support members by providing the most up to date information on Covid regulations for our workers and our businesses.

Worker shortages continue to be a problem in agriculture and many other industries. This will be the case for the foreseeable future. We would not be able to grow our crops if horticulture didn't have access to SAWP workers. The OAG will continue to work with Ontario Fruit & Vegetable Growers' Association (OFVGA) on the labour file and keep you apprised of any changes as they happen.

Inflation was a major issue this year as input prices skyrocketed. On our farm, fertilizer expense was up 70% over last year. You can't turn on the news without hearing how concerned consumers are about the increased cost of groceries. It will be interesting to see whether apple consumption stays strong, or if people think fruit is too expensive.

The OAG conducted a survey of members asking them their planting intentions for the next 5 years. The answers point to an optimistic view of the future because 44% of the respondents indicated that they intend to increase their acreage, 44% said they'd maintain their size, while only 11% plan to decrease the size of their orchards. I predict that there will be lots of apple orchards changing ownership in the next few years due to growers retiring. Farmers aren't normal when it comes to retirement age however, we do tend to go on and on.

Two key areas for the OAG are research and promotions. With regards to research, we are very fortunate to have received government and stakeholder funding to help our research budget go farther. I encourage you to read the summary research findings in this Annual Report. We are coming to the end of a five-year national Research Cluster, and we've spent considerable time reviewing new project proposals for the next Cluster. We are hopeful to have several projects included in the new Cluster which would begin April 2023.

Thank you to OAG Vice Chair Brian Rideout for his assistance as Chair of the Research Committee which includes crop protection issues. Brian is also the OFVGA Crop Protection Section Chair and while issues seem to be somewhat quieter than pre-pandemic, there is still work to be done to ensure that hort growers have the tools and technology they need to produce quality crops.

Promotions are another very important area for the OAG with the goal of building consumer preference and public trust for Ontario apples. We are thankful to receive grant funding from OMAFRA's Grassroots Growth Initiative for promo activities for the 2022 and 2023 crop years. Thank you also to the Apple Marketers' Association of Ontario for their contribution again this year.

I thank the Board of Directors and the Committee reps for their continued participation and offering unique perspectives on the issues of the day. To our wonderful manager, Kelly, a big thank you for another of 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. We are fortunate to have a cohesive staff team who work collaboratively, not only the Tender Fruit Board, but also other partner organizations. Thank you as well to the OFVGA for their leadership on provincial advocacy and to the FVGC for their work on federal issues.

Respectfully submitted,

Cathy McKay
Chair

# STRATEGIC PLAN 2020-2025

## VISION

Ontario apples: The first pick for healthy consumers.

## VALUES

Integrity
Collaboration
Leadership
Innovation
Respect
Quality

## MISSION

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

## OUR WORK

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

## FIVE KEY FOCUS AREAS

**Promotion**
Promote Ontario apples

**Advocacy**
For competitiveness and innovation

**Information**
Keep members informed

**Improve**
Fruit quality and efficiency through research

**Governance**
Effective governance and operations

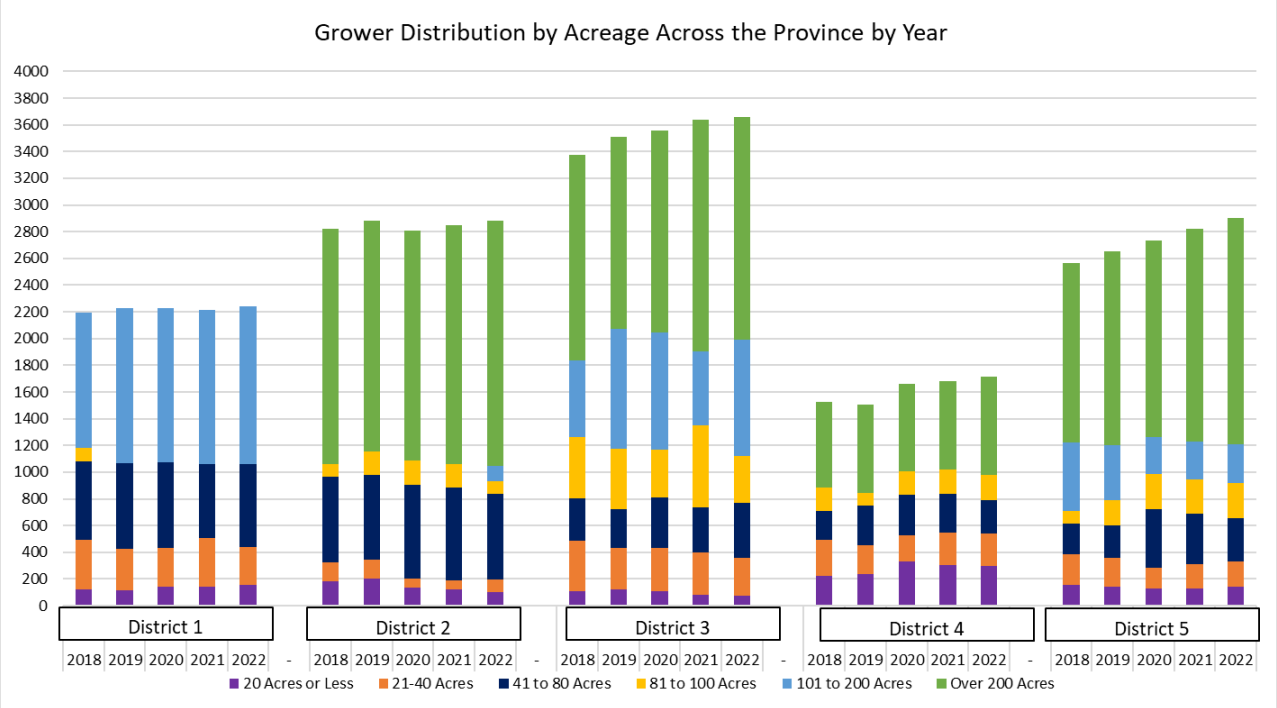
ONTARIO APPLE GROWERS

Proudly representing over 200 Ontario apple grower members

# OAG MEMBERSHIP

| District | Number of Grower Members | District Committee Representatives |
|---|---|---|
| District 1 | 40 | 3 |
| District 2 | 28 | 3 |
| District 3 | 35 | 3 |
| District 4 | 37 | 3 |
| District 5 | 31 | 3 |
| **Total - Members** | **171** | **15** |
| Voluntary Members | 57 | |
| **Total - All Members** | **228** | |

**2018 – 2022 OAG Grower Distribution by Acreage**

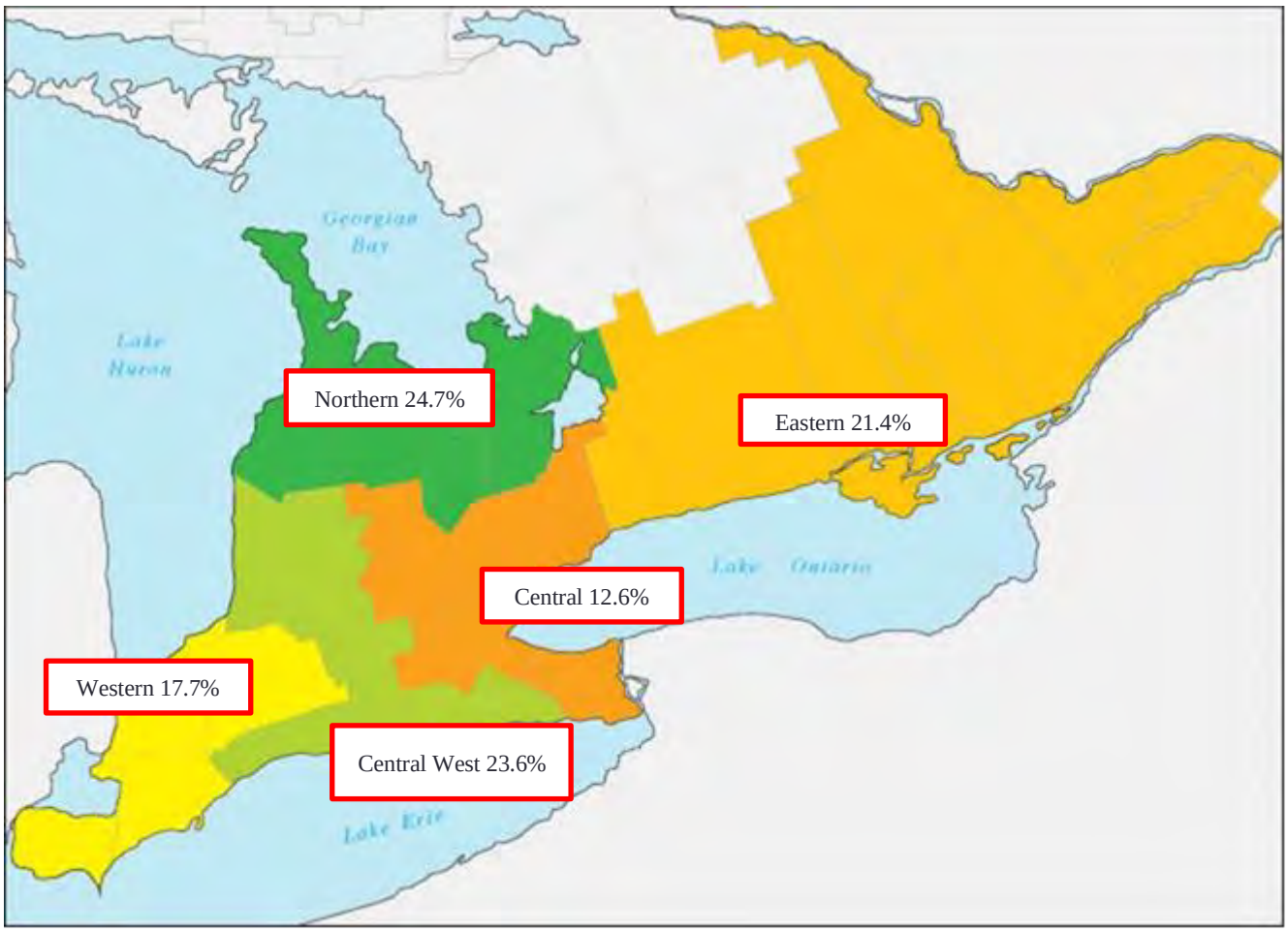


# ACREAGE REVIEW

## Tree Census

Tree census information (as of January 1st, 2022) included in this report 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 15,573 bearing and non-bearing acres in Ontario in 2021. The assumption is that the variety mix for the remaining acres is the same as for mapped acreage.

## Ontario Acreage by District




**District Boundaries**

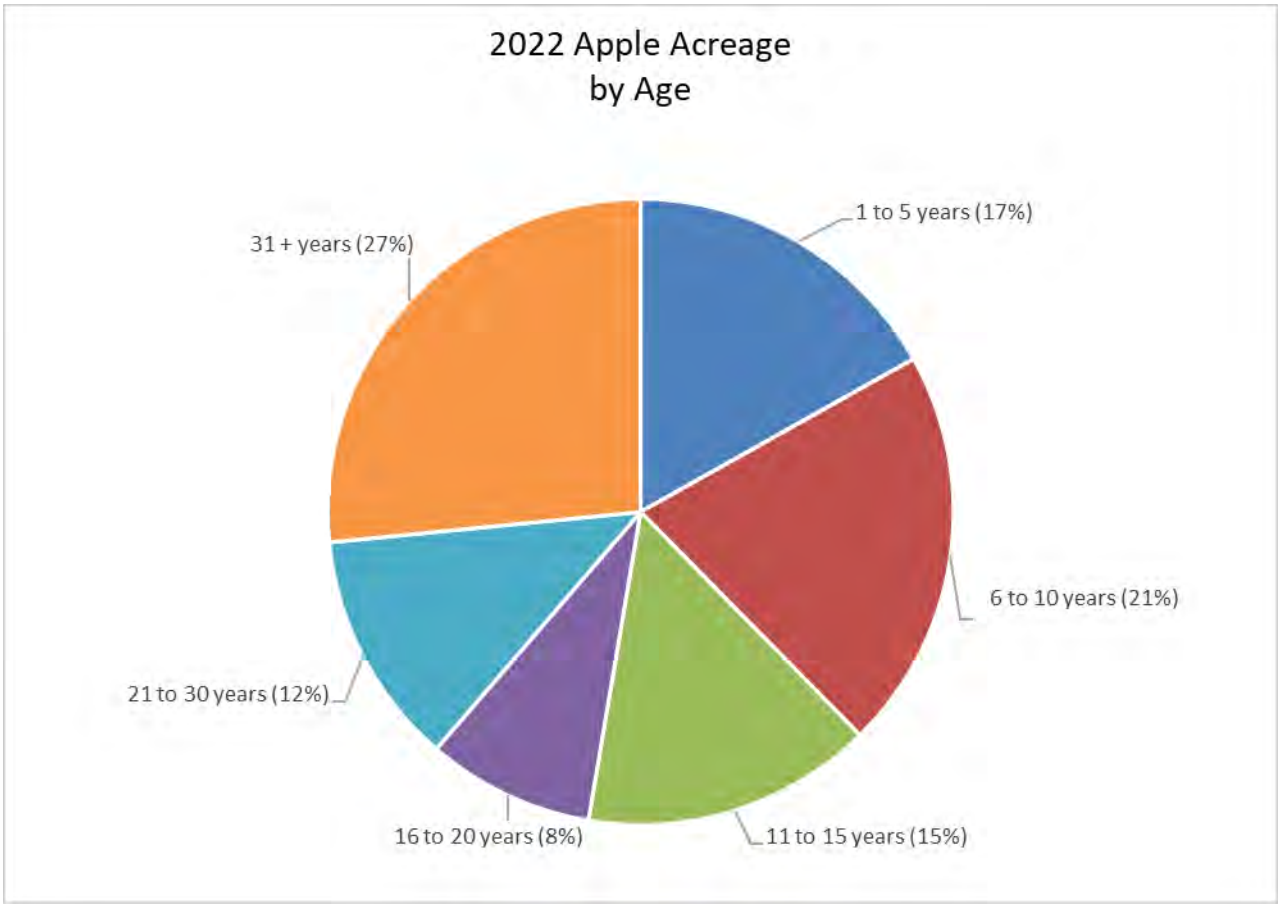
**District 1** *Western* is comprised of the upper-tier municipalities of Essex, Lambton & Middlesex and the single-tier municipality of Chatham-Kent.

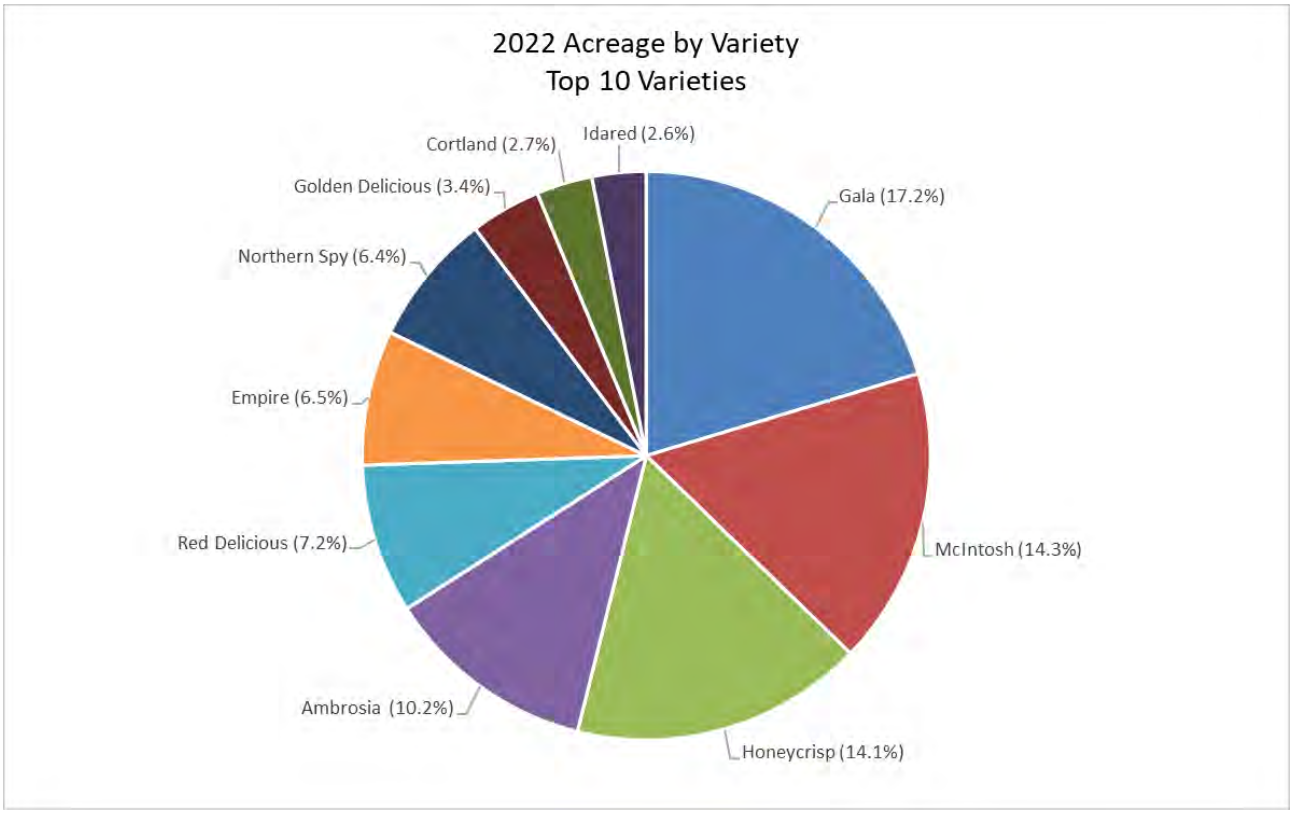
**District 2** *Central West* is comprised of the upper-tier municipalities of Huron, Perth, Oxford & Elgin and the single-tier municipalities of Haldimand and Norfolk.

**District 3** *Northern* is comprised of the upper-tier municipalities of Bruce, Grey, Simcoe and Dufferin.

**District 4** *Central* is comprised of the upper-tier municipalities of Wellington, Peel, York, Halton, Waterloo and Niagara and the single tier-municipalities of Brant, Toronto and Hamilton.

**District 5** *Eastern* is comprised of the upper-tier municipalities of Durham, Northumberland, Peterborough, Frontenac, Hastings, Lannark, Lennox & Addington, Leeds & Grenville, Renfrew & Stormont, Dundas & Glengarry & Prescott & Russell and the single-tier municipalities of Kawartha Lakes, Ottawa and Prince Edward.

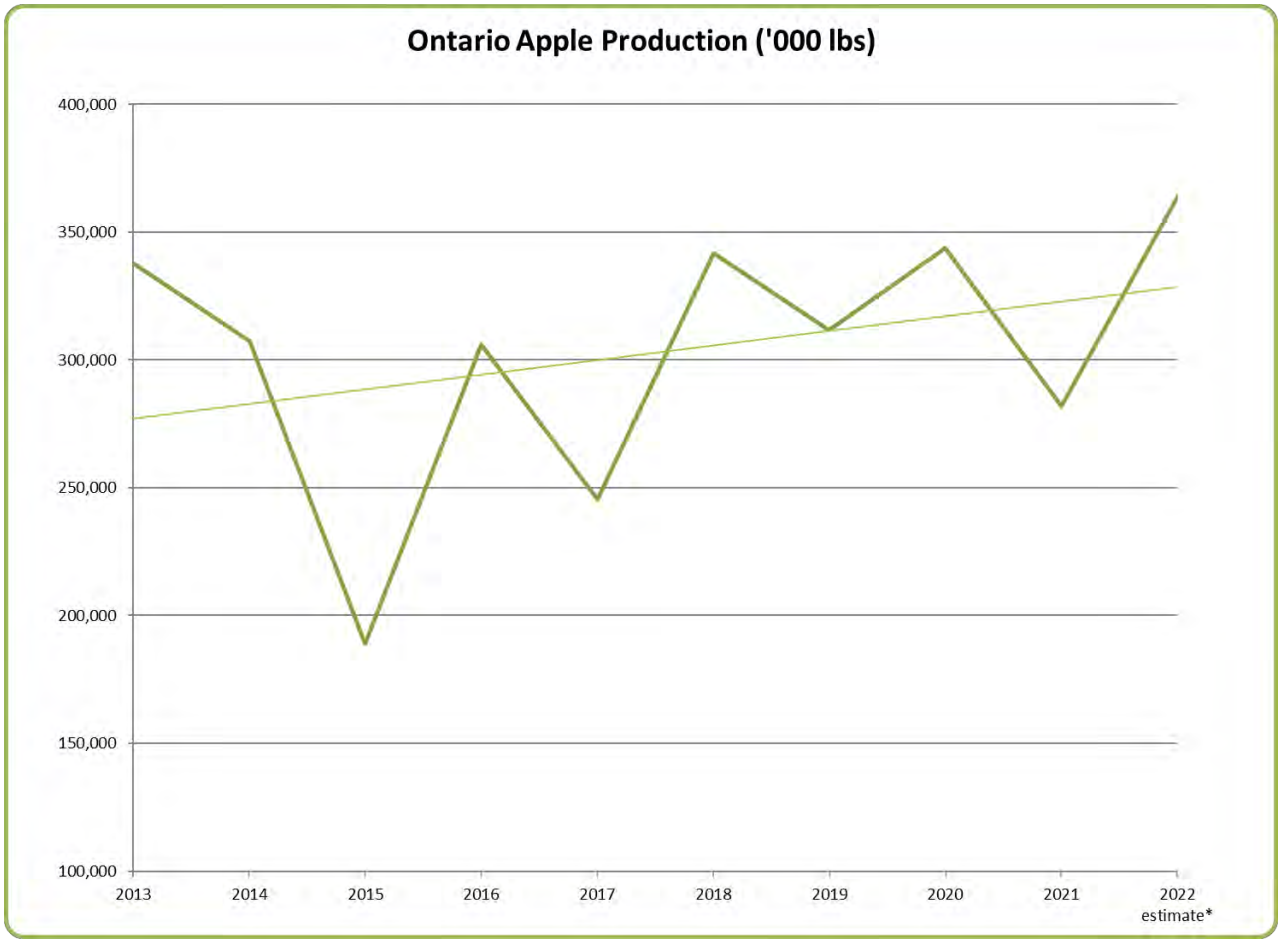

2022 Apple Acreage
by Age
1 to 5 years (17%)
6 to 10 years (21%)
11 to 15 years (15%)
16 to 20 years (8%)
21 to 30 years (12%)
31 + years (27%)


2022 Acreage by Variety
Top 10 Varieties
Gala (17.2%)
McIntosh (14.3%)
Honeycrisp (14.1%)
Ambrosia (10.2%)
Red Delicious (7.2%)
Empire (6.5%)
Northern Spy (6.4%)
Golden Delicious (3.4%)
Cortland (2.7%)
Idared (2.6%)

# APPLE PRODUCTION

| Ontario Apple Production – 2017 TO 2022 | | |
|---|---|---|
| **Years** | **Production ('000 lbs)** | **% Change From Previous Year** |
| 2017 | 245,357 | -30.0% |
| 2018 | 341,823 | 39.3% |
| 2019 | 311,705 | -8.8% |
| 2020 | 343,751 | 10.3% |
| 2021 | 281,845 | -18.0% |
| 2022 estimate* | 363,970 | 29.1% |
| 5 Yr Avg (’17 –’21) | 304,896 | -16.2% |
| | | |

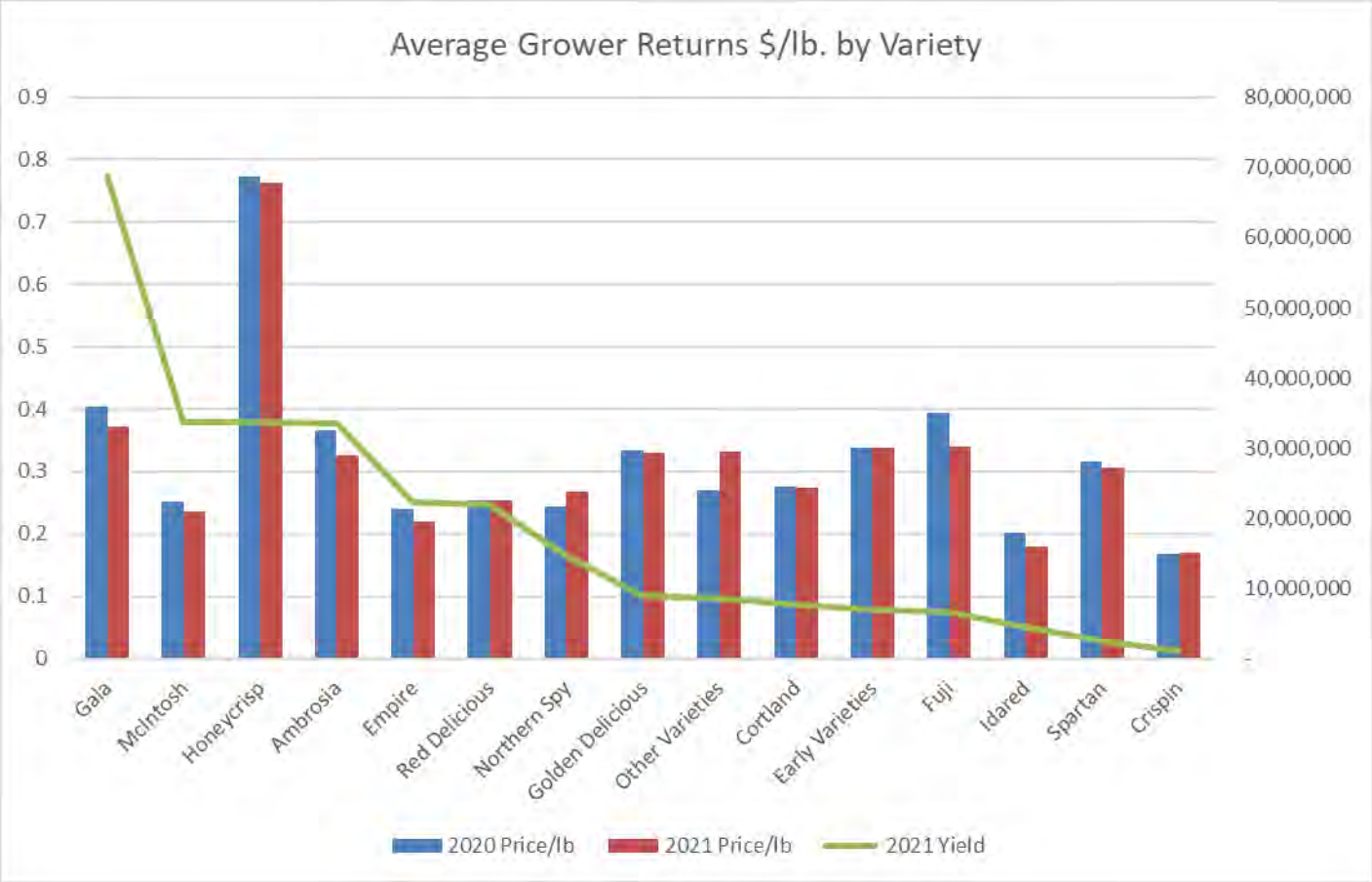
Source: OAG Annual Apple Marketing Survey and Apple Yield Report Note: Production volumes exclude orchard juice



# MARKETING REVIEW

The results of the 2021 crop marketing survey include comparative figures from the 2020 year begin on page 12. The survey provides the industry average returns per pound and per bin (820 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 (page 13) indicates that pricing was down $0.04/lb across all varieties for fresh. The three top returning varieties are Honeycrisp, Gala, and Ambrosia. Processing apples were in demand in 2021/2022 and prices were up vs. 2020.




### Flyer Ad and Retail Price Tracking

The OAG tracks apple flyer ad activity at major retail. We record retail chain, variety, pack (bulk or bag), price/lb. and country of origin. This information is shared with the apple packers on a weekly basis. Additionally, this year we have started to receive grocery store information on four varieties from Foodland Ontario representatives. Representatives are recording 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.

# APPLE STATISTICS

| ONTARIO APPLE GROWERS<br>2022 APPLE YIELD BY VARIETY | | | | | | |
|---|---|---|---|---|---|---|
| **Variety** | **2021 Production ('000 lbs)** | **2022 Production ('000 lbs)** | **2022 Production ('000 bushels)** | **% Change 2022 vs. 2021** | **5-Year Average Production (2017-2021) ('000 lbs)** | **% Change 2022 vs. 5-Year Avg** |
| Ambrosia | 34,231 | 41,146 | 980 | 20.2% | 23,326 | 76.4% |
| Cortland | 7,913 | 9,693 | 231 | 22.5% | 10,308 | -6.0% |
| Crispin/Mutsu | 1,067 | 760 | 18 | -28.8% | 2,381 | -68.1% |
| Empire | 22,841 | 23,778 | 566 | 4.1% | 31,096 | -23.5% |
| Fuji | 6,727 | 10,165 | 242 | 51.1% | 4,976 | 104.3% |
| Gala | 70,606 | 90,094 | 2,145 | 27.6% | 58,680 | 53.5% |
| Golden Delicious | 9,112 | 7,481 | 178 | -17.9% | 8,861 | -15.6% |
| Honeycrisp | 34,547 | 56,104 | 1,336 | 62.4% | 32,888 | 70.6% |
| Idared | 4,459 | 4,262 | 101 | -4.4% | 4,746 | -10.2% |
| McIntosh | 34,475 | 41,818 | 996 | 21.3% | 50,186 | -16.7% |
| Northern Spy | 9,890 | 24,680 | 588 | 149.5% | 27,157 | -9.1% |
| Red Delicious | 26,400 | 24,343 | 580 | -7.8% | 25,324 | -3.9% |
| Spartan | 2,518 | 2,896 | 69 | 15.0% | 4,356 | -33.5% |
| Other Early Varieties | 7,239 | 8,934 | 213 | 23.4% | 8,099 | 10.3% |
| Other Late Varieties | 9,820 | 17,817 | 424 | 81.4% | 12,512 | 42.4% |
| **Total Fresh** | **281,845** | **363,970** | **8,666** | **29.1%** | **304,896** | **19.4%** |

**2021 ONTARIO APPLE PRODUCTION BY UTILIZATION**

| PRODUCTION (LBS.) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Variety** | **Fresh** | | **Orchard Juice*** | | **Other Processing** | | **Total** | |
| | **2021** | 2020 | **2021** | 2020 | **2021** | 2020 | **2021** | 2020 |
| Ambrosia | **28,544,625** | 26,793,767 | | | **4,893,004** | 23,106 | **33,437,629** | 26,816,873 |
| Cortland | **7,013,818** | 10,626,656 | | | **703,950** | 309,921 | **7,717,768** | 10,936,577 |
| Crispin (Mutsu) | **80,083** | 2,196,044 | | | **1,006,500** | 577,822 | **1,086,583** | 2,773,866 |
| Early Varieties | **6,988,429** | 9,164,090 | | | **56,829** | 367,166 | **7,045,258** | 9,531,256 |
| Empire | **19,668,614** | 27,092,673 | | | **2,626,053** | 2,148,588 | **22,294,667** | 29,241,261 |
| Fuji | **6,186,971** | 7,208,954 | | | **368,353** | - | **6,555,324** | 7,208,954 |
| Gala | **68,396,894** | 66,915,399 | | | **308,373** | 93,270 | **68,705,267** | 67,008,669 |
| Golden Delicious | **8,792,301** | 10,408,501 | | | **75,121** | 45,466 | **8,867,422** | 10,453,967 |
| Honeycrisp | **33,430,796** | 46,542,904 | | | **186,706** | 103,088 | **33,617,502** | 46,645,992 |
| Idared | **0** | 0 | | | **4,458,559** | 8,567,710 | **4,458,559** | 8,567,710 |
| McIntosh | **26,026,806** | 32,407,439 | | | **7,724,656** | 15,824,972 | **33,751,462** | 48,232,411 |
| Northern Spy | **0** | 0 | | | **14,707,865** | 23,201,456 | **14,707,865** | 23,201,456 |
| Red Delicious | **20,992,531** | 25,700,628 | | | **1,005,868** | 195,419 | **21,998,399** | 25,896,047 |
| Spartan | **2,107,770** | 3,439,920 | | | **351,610** | 2,001,017 | **2,459,380** | 5,440,937 |
| Other Varieties | **6,951,779** | 8,463,642 | | | **1,653,773** | 4,517,252 | **8,605,552** | 12,980,894 |
| Mixed Varieties - Juice** | **-** | - | **9,105,375** | 14,061,600 | **6,536,410** | 8,814,125 | **15,641,785** | 22,875,725 |
| **Total** | **235,181,417** | 276,960,617 | **9,105,375** | 14,061,600 | **46,663,630** | 66,790,378 | **290,950,422** | 357,812,595 |

*Orchard Juice represents apples picked specifically for juice from Ontario orchards.

**Juice production cannot be accurately reported by variety therefore it is reported as a total of mixed varieties.

**2021 ONTARIO APPLE GROWER PRICE PER LB.**

| GROWER PRICE ($/LB) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Variety** | **Net Return/ 820 Lb. Bin** | **Fresh ($)** | | **Orchard Juice Processing ($)** | | **Other Processing ($)** | | **Average Fresh and Other Processing ($)** | |
| | **2021** | **2021** | 2020 | **2021** | 2020 | **2021** | 2020 | **2021** | 2020 |
| Ambrosia | **$ 282** | **0.344** | 0.366 | | | **0.220** | 0.186 | **0.326** | 0.366 |
| Cortland | **$ 230** | **0.280** | 0.276 | | | **0.200** | 0.231 | **0.273** | 0.275 |
| Crispin (Mutsu) | **$ 229** | **0.279** | 0.175 | | | **0.160** | 0.144 | **0.169** | 0.168 |
| Early Varieties | **$ 276** | **0.336** | 0.342 | | | **0.213** | 0.230 | **0.335** | 0.338 |
| Empire | **$ 180** | **0.220** | 0.240 | | | **0.219** | 0.229 | **0.220** | 0.239 |
| Fuji | **$ 285** | **0.348** | 0.395 | | | **0.220** | - | **0.340** | 0.395 |
| Gala | **$ 306** | **0.374** | 0.405 | | | **0.231** | 0.160 | **0.373** | 0.405 |
| Golden Delicious | **$ 271** | **0.331** | 0.335 | | | **0.212** | 0.160 | **0.330** | 0.334 |
| Honeycrisp | **$ 628** | **0.766** | 0.774 | | | **0.231** | 0.174 | **0.763** | 0.773 |
| Idared | **$ -** | **-** | - | | | **0.179** | 0.201 | **0.179** | 0.201 |
| McIntosh | **$ 203** | **0.247** | 0.275 | | | **0.197** | 0.205 | **0.236** | 0.252 |
| Northern Spy | **$ -** | **-** | - | | | **0.267** | 0.243 | **0.267** | 0.243 |
| Red Delicious | **$ 209** | **0.255** | 0.255 | | | **0.220** | 0.205 | **0.253** | 0.254 |
| Spartan | **$ 267** | **0.326** | 0.338 | | | **0.183** | 0.278 | **0.305** | 0.316 |
| Other Varieties | **$ 291** | **0.354** | 0.315 | | | **0.234** | 0.183 | **0.331** | 0.269 |
| Mixed Varieties - Juice | **$ -** | **-** | - | **0.180** | 0.104 | **0.205** | 0.129 | **0.205** | 0.129 |
| **Avg. Grower Price - All Utilization ($/lb)** | **$ 302** | **0.368** | 0.409 | **0.180** | 0.104 | **0.241** | 0.207 | **0.350** | 0.355 |
| **Avg. Transaction - All Utilization ($/lb)** | | **0.426** | 0.480 | **0.180** | 0.104 | **0.261** | 0.227 | **0.392** | 0.418 |

**2021 ONTARIO APPLE GROWER VALUE**

| GROWER VALUE $ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Variety** | **Fresh ($)** | | **Orchard Juice ($)** | | **Other Processing ($)** | | **Total ($)** | |
| | **2021** | 2020 | **2021** | 2020 | **2021** | 2020 | **2021** | 2020 |
| Ambrosia | **9,829,715** | 9,819,682 | | | **1,075,929** | 4,297 | **10,905,644** | 9,823,979 |
| Cortland | **1,963,113** | 2,936,539 | | | **140,983** | 71,727 | **2,104,096** | 3,008,267 |
| Crispin (Mutsu) | **22,324** | 383,679 | | | **161,212** | 82,946 | **183,536** | 466,624 |
| Early Varieties | **2,348,502** | 3,133,722 | | | **12,117** | 84,340 | **2,360,619** | 3,218,062 |
| Empire | **4,322,663** | 6,489,861 | | | **575,929** | 491,959 | **4,898,592** | 6,981,820 |
| Fuji | **2,150,747** | 2,848,277 | | | **81,106** | - | **2,231,852** | 2,848,277 |
| Gala | **25,552,112** | 27,102,768 | | | **71,161** | 14,903 | **25,623,274** | 27,117,671 |
| Golden Delicious | **2,906,656** | 3,482,865 | | | **15,927** | 7,268 | **2,922,582** | 3,490,133 |
| Honeycrisp | **25,613,411** | 36,028,262 | | | **43,077** | 17,891 | **25,656,488** | 36,046,152 |
| Idared | **-** | - | | | **799,712** | 1,722,044 | **799,712** | 1,722,044 |
| McIntosh | **6,439,132** | 8,912,294 | | | **1,519,702** | 3,241,196 | **7,958,834** | 12,153,490 |
| Northern Spy | **-** | - | | | **3,928,894** | 5,645,468 | **3,928,894** | 5,645,468 |
| Red Delicious | **5,349,231** | 6,542,683 | | | **221,291** | 40,135 | **5,570,522** | 6,582,817 |
| Spartan | **686,104** | 1,161,501 | | | **64,347** | 557,188 | **750,450** | 1,718,689 |
| Other Varieties | **2,463,693** | 2,668,461 | | | **387,419** | 828,726 | **2,851,112** | 3,497,188 |
| Mixed Varieties -Juice | **-** | - | **1,640,720** | 1,457,645 | **1,342,328** | 1,133,844 | **2,983,048** | 2,591,489 |
| **Total Grower Value** | **89,647,402** | 111,510,594 | **1,640,720** | 1,457,645 | **10,441,133** | 13,943,932 | **101,729,255** | 126,912,171 |
| **Total Transaction Value** | **100,209,042** | 132,994,111 | **1,640,720** | 1,457,645 | **12,181,639** | 15,138,146 | **114,031,401** | 149,589,902 |

## 2021 Ontario Apple Tree Acreage By Variety, By District

| Variety Name | 1 Western | 2 Central West | 3 Northern | 4 Central | 5 Eastern | Total Acreage | 2021 % of Total Acreage | 2020 % of Total Acreage |
|---|---|---|---|---|---|---|---|---|
| Gala | 537 | 711 | 195 | 426 | 844 | 2,713 | 17.2% | 16.9% |
| McIntosh | 137 | 581 | 1,032 | 148 | 359 | 2,256 | 14.3% | 15.2% |
| Honeycrisp | 317 | 388 | 472 | 317 | 734 | 2,228 | 14.1% | 13.4% |
| Ambrosia | 380 | 365 | 275 | 261 | 331 | 1,612 | 10.2% | 9.2% |
| Red Delicious | 260 | 388 | 68 | 136 | 284 | 1,135 | 7.2% | 7.8% |
| Empire | 226 | 462 | 162 | 60 | 120 | 1,029 | 6.5% | 7.3% |
| Northern Spy | 59 | 239 | 647 | 29 | 29 | 1,004 | 6.4% | 6.7% |
| *Other Cultivars | 128 | 77 | 303 | 105 | 205 | 819 | 5.2% | 4.8% |
| Golden Delicious | 249 | 101 | 6 | 106 | 66 | 528 | 3.4% | 3.5% |
| Cortland | 37 | 80 | 128 | 82 | 96 | 422 | 2.7% | 2.7% |
| Idared | 59 | 84 | 222 | 13 | 30 | 408 | 2.6% | 2.6% |
| Fuji | 149 | 70 | 16 | 41 | 55 | 331 | 2.1% | 1.9% |
| Crispin/Mutsu | 71 | 53 | 20 | 83 | 14 | 241 | 1.5% | 1.7% |
| Paulared | 36 | 36 | 40 | 23 | 89 | 224 | 1.4% | 1.4% |
| Spartan | 5 | 27 | 138 | 17 | 25 | 212 | 1.3% | 1.4% |
| Ginger Gold | 56 | 27 | 10 | 26 | 36 | 155 | 1.0% | 1.0% |
| Crimson Crisp | 16 | 3 | 76 | 35 | 11 | 142 | 0.9% | 0.8% |
| Mixed | 32 | 5 | 3 | 46 | 37 | 124 | 0.8% | 0.8% |
| Jonagold | 31 | 21 | 29 | 22 | 1 | 105 | 0.7% | 0.6% |
| Jerseymac | 9 | 2 | 51 | 2 | 1 | 65 | 0.4% | 0.4% |
| | | | | | | | | |
| **TOTAL** | **2,794** | **3,719** | **3,893** | **1,979** | **3,368** | **15,753** | **100%** | **100%** |

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, Jonamac, Kingston Black, Liberty, Lobo, Lodi, Macoun, Marshall Mac, Mascad De Dieppe, Melba, Michelin, Nicola, Novaspy, Porter's Perfection, Quinte, 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 (2017-2021) | 6 To 10 Years (2012-2016) | 11 To 15 Years (2007-2011) | 16 To 20 Years (2002-2006) | 21 To 30 Years (1992-2001) | 31 Years and Over (Pre-1992) | Total Acreage | 2021 % of Total Acreage |
|---|---|---|---|---|---|---|---|---|
| Gala | 612 | 1,102 | 433 | 234 | 292 | 39 | 2,713 | 17.2% |
| McIntosh | 44 | 157 | 200 | 187 | 268 | 1,401 | 2,256 | 14.3% |
| Honeycrisp | 766 | 595 | 533 | 243 | 88 | 3 | 2,228 | 14.1% |
| Ambrosia | 604 | 557 | 277 | 170 | 2 | 1 | 1,612 | 10.2% |
| Red Delicious | 110 | 277 | 61 | 50 | 216 | 421 | 1,135 | 7.2% |
| Empire | 11 | 31 | 61 | 75 | 235 | 616 | 1,029 | 6.5% |
| Northern Spy | 5 | 5 | 74 | 69 | 211 | 641 | 1,004 | 6.4% |
| *Other Cultivars | 254 | 117 | 162 | 128 | 67 | 92 | 819 | 5.2% |
| Golden Delicious | 15 | 67 | 99 | 90 | 149 | 108 | 528 | 3.4% |
| Cortland | 40 | 70 | 85 | 30 | 68 | 130 | 422 | 2.7% |
| Idared | 5 | 20 | 4 | 11 | 30 | 339 | 408 | 2.6% |
| Fuji | 118 | 106 | 28 | 20 | 46 | 13 | 331 | 2.1% |
| Crispin/Mutsu | 6 | 14 | 30 | 38 | 82 | 71 | 241 | 1.5% |
| Paulared | 15 | 65 | 37 | 3 | 12 | 93 | 224 | 1.4% |
| Spartan | 2 | 4 | 6 | 4 | 43 | 155 | 212 | 1.3% |
| Ginger Gold | 24 | 29 | 24 | 14 | 62 | 3 | 155 | 1.0% |
| Crimson Crisp | 43 | 94 | 4 | - | 0 | - | 142 | 0.9% |
| Mixed | 5 | 4 | 14 | 18 | 32 | 51 | 124 | 0.8% |
| Jonagold | 24 | 13 | 9 | 3 | 35 | 21 | 105 | 0.7% |
| Jerseymac | 1 | 0 | 1 | 0 | 5 | 57 | 65 | 0.4% |
| | | | | | | | | |
| **TOTAL** | **2,703** | **3,327** | **2,140** | **1,386** | **1,943** | **4,254** | **15,753** | **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, Jonamac, Kingston Black, Liberty, Lobo, Lodi, Macoun, Marshall Mac, Mascad De Dieppe, Melba, Michelin, Nicola, Novaspy, Porter's Perfection, Quinte, 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!.

| IMPORTS OF FRESH APPLES 2021 CROP YEAR (LBS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **PROVINCE** | **HONEYCRISP** | **GALA** | **GOLDEN DELICIOUS** | **GRANNY SMITH** | **IDA RED** | **MCINTOSH** | **RED DELICIOUS** | **UNSPECIFIED** | **TOTAL** |
| Alberta | 38,559 | 1,030,946 | 15,159 | 215,349 | | | 158,689 | 446,854 | 1,905,557 |
| British Columbia | 3,566,233 | 44,409,945 | 2,812,118 | 15,699,302 | | | 11,967,954 | 53,403,070 | 131,858,622 |
| Manitoba | 35,338 | 185,210 | 30,400 | 90,191 | | | 109,850 | 32,811 | 483,799 |
| New Brunswick | 1,709,334 | 457,604 | 1,960 | 12,923 | | | 16,667 | 37,714 | 2,236,203 |
| Nova Scotia | | 658,028 | | 188,140 | | | | 477,203 | 1,323,372 |
| **Ontario** | **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** |
| Québec | 154,270 | 4,330,961 | 272,288 | 3,191,505 | 44,308 | | 241,834 | 2,635,923 | 10,871,089 |
| Saskatchewan | 3,920 | 59,115 | 8,900 | 53,442 | | | 32,961 | 183,407 | 341,745 |
| **Total By Variety** | **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** |
| | | | | | | | | | |
| Ontario - 2020 | 2,007,348 | 50,161,717 | 6,190,132 | 24,215,577 | 25,895 | 43,971 | 9,051,217 | 30,311,466 | 122,007,324 |
| **Ontario - 2021 vs. 2020** | **129%** | **5%** | **-1%** | **6%** | **227%** | **209%** | **27%** | **31%** | **15%** |
| Total By Variety - 2020 | 4,987,097 | 95,074,440 | 10,071,108 | 49,683,250 | 4,596,917 | 47,331 | 20,267,098 | 89,064,540 | 273,791,782 |
| **Total By Variety - 2021 vs. 2020** | **103%** | **9%** | **-8%** | **-9%** | **-97%** | **187%** | **19%** | **9%** | **6%** |

| IMPORTS OF FRESH APPLES - 5 YEAR AVERAGE 2017-2021 CROP YEARS (LBS) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **PROVINCE** | ***HONEYCRISP** | **GALA** | **GOLDEN DELICIOUS** | **GRANNY SMITH** | **IDA RED** | **MCINTOSH** | **RED DELICIOUS** | **UNSPECIFIED** | **TOTAL** |
| Alberta | 19,830 | 643,915 | 35,775 | 203,493 | | 168 | 105,341 | 393,888 | 1,402,410 |
| British Columbia | 2,334,286 | 43,653,036 | 3,977,710 | 18,565,054 | 38,443 | 11,102 | 14,245,263 | 48,897,481 | 131,722,374 |
| Manitoba | 7,793 | 129,470 | 25,231 | 77,077 | | 55,824 | 59,288 | 70,416 | 425,098 |
| New Brunswick | 377,838 | 428,406 | 5,892 | 102,878 | 647,134 | 2,607 | 25,548 | 491,654 | 2,081,958 |
| Nova Scotia | 9,168 | 911,861 | | 69,352 | 1,296,579 | | | 717,240 | 3,004,199 |
| **Ontario** | **1,897,580** | **60,039,472** | **6,999,543** | **24,978,170** | **331,199** | **129,579** | **13,616,232** | **31,198,731** | **139,190,506** |
| Québec | 56,651 | 4,856,465 | 556,723 | 6,391,971 | 37,305 | 198,474 | 738,609 | 4,592,732 | 17,428,929 |
| Saskatchewan | 2,744 | 117,691 | 7,709 | 57,804 | | 672 | 11,758 | 194,738 | 393,116 |
| **Total by Variety** | **4,705,889** | **110,780,315** | **11,608,584** | **50,445,799** | **2,350,660** | **398,426** | **28,802,038** | **86,556,879** | **295,648,590** |
| | | | | | | | | | |
| **Ontario - 2021 vs. 5 Year Average** | **142%** | **-12%** | **-13%** | **3%** | **-74%** | **5%** | **-15%** | **27%** | **1%** |
| **Total By Variety - 2021 vs. 5 Year Average** | **115%** | **-6%** | **-20%** | **-11%** | **-95%** | **-66%** | **-16%** | **12%** | **-2%** |

Note:
*Data available for full crop year starting in 2019 as a new harmonized system code for Honeycrisp was introduced part way through 2018
The province denotes the port of entry and may not necessarily reflect the final provincial destination of imported apples.
Source: Statistics Canada

# PROMOTION

Building on the many successes of the digital program launched last season, Ontario Apple Growers sought out new and exciting opportunities to expand our promotions and amplify key messaging to a larger, more diverse audience.

**Global Heroes**

Apple recipe advertorial placement in The Toronto Star, The Globe and Mail and The National Post as well as the Global Heroes Digital Edition. Combined total readership of these publications is 1.8 million.


Issue highlights and results:

- New apple oat bars recipe included
- Call to action in clickable top banner would redirect readers to our website's find a farm feature
- Ad had a total of 22,000 Engagements and 181,000 Impressions


**Diabetes Conference**

OAG participated in the Type-1 Diabetes Conference that took place on Saturday, October 2, 2021, with a virtual apple booth (pictured). The booth included clickable resources like recipes, blogs, and social media handles. We also had a chat feature with two registered dietitians available to answer attendee's health-related questions. In total, 174 people visited the booth.

**Media Appearances**

Carol Harrison and Shannon Crocker, the registered dietitians who were present at our virtual apple booth, had "healthier snacks for the holidays" segments on Global TV and CHCH throughout December to showcase how to best use Ontario apples in healthier Christmas treats. Viewers were reminded to look for the Foodland logo in stores and that local apples will continue to be available throughout the winter months.

**TV Commercials and Radio Tags**

With the start of the new year, television commercials showing how Ontario apples get from the farm to the fruit bowl aired on CHCH, Rogers Television and CP24. With nearly 350 spots in total, our apple commercials reached an outstanding 16 million viewers over 10 weeks! Similarly, radio tags played in 6 markets reminding over 500,000 weekly listeners that Ontario apples are available in stores.

**Print and Digital Media**

A full page spread in *Nest* magazine and video advertisements on condo screens across the GTA were highlighted in February while many people were working from home. A total of 242 screens in 56 residential buildings garnered 800,000 impressions over 325,000 video executions. Additionally, 125,000 copies of the magazine were distributed.


**Social Media**

Our social networks continue to gain in popularity with messaging around variety of apples grown in Ontario, health benefits of apples, how to store and handle apples and of course, a plethora of recipes to inspire even the most novice of chefs. As of April 2022, we had 11,037 Facebook followers, 2,565 Instagram followers, 3,127 Twitter followers and 2,800 views on YouTube with 28 new subscribers.

Some of our most popular posts included our own growers' stories and content we reshared from our friends at More than a Migrant Worker and Farm and Food Care Ontario about seasonal farm workers and the faces behind food.

## Produce Made Simple Partnership

**Brand Ambassadors**

Produce Made Simple ambassadors delivered an exceptional campaign over the winter months using videos on Instagram to demonstrate how to find Ontario apples in store by looking for the Foodland Ontario logo, and then use them in a delicious recipe. The reels had a whopping 385,000 views and nearly 11,000 engagements combined!

## Foodland Ontario Promotions

**Television Campaign**

"Make it Local" commercials were developed with the objective to translate consumer intent into action and increase purchases of Ontario foods. The targeted audience was exposed to all the things that local food can do, while encouraging them to make simple changes to "Make It Local" more often and provide context around the ways choosing Ontario food can help.

Tactics:

- Television – 30 and 15 second spots
- Online Video (OLV)
- Radio – 10 second tags
- Digital – 15 and 6 second spots
- Paid social media posts to support the campaign

**Radio Tags**

Ontario apples were advertised during the weeks of September 6th and March 7th.

**Public Relations**

From September to December, Ontario apples were featured in 9 television appearances reaching an audience of 76,900. They were also a main ingredient in the September-October, November-December 2021 recipe releases as well as the January-February and March 2022 releases. In addition to these placements, Foodland Ontario has a newsletter called "Fresh Perspectives". Ontario apples were featured in the Fall 2021, Winter 2021-22, and Spring 2022 editions.

**Website and Calendar**

On the Foodland Ontario website, approximately 100 recipes can be found that feature Ontario apples. In the 2021 Calendar, apples appeared on the front cover and the month of December in a French Toast Breakfast Muffin recipe. In the 2022 Calendar, apples were the star ingredient in February in the Apple Loaf Cake recipe and were included in the Availability Guide. 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 also supports Ontario apple promotions online via their social media channels with organic and paid ads on Facebook, Instagram, and Twitter. The results of these posts are outlined below:

- ✓ Facebook posts in relation to Ontario Apples reached approximately 320,000 users and initiated over 6,468 engagements
- ✓ Instagram posts in relation to Ontario Apples generated 29,747 impressions, and 913 engagements
- ✓ Twitter tweets in relation to Ontario Apples gathered 18,082 impressions, and 354 engagements

A total of 47 ads featuring Ontario apples were targeted and boosted generating 2.8 million impressions on each channel.

**Retailer Display Contest**

The Fall Apple Retail Display Contest ran from September 20th – November 26th with a total of 177 entries. Retailers built prominent displays in their produce section to advertise the start of apple season and availability of Ontario apples in-store. Foodland Ontario printed 5,250 Apple Recipe Pads in English and 250 in French, along with 5,000 Apple Variety Posters to assist with marketing and promotion in grocery stores.



A huge thank you to our partners for their continued support. Be sure to share your Ontario apple posts with us by tagging @ontarioapples and 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 November 2, 2022)

| Year | Processed | Payments | Total $ | Average |
|---|---|---|---|---|
| 2021 | 75 | 5 | $ 121,259 | $ 24,252 |
| 2020 | 133 | 17 | $ 488,167 | $ 28,716 |
| 2019 | 134 | 20 | $ 491,876 | $ 24,594 |
| 2018 | 140 | 23 | $ 911,363 | $ 39,624 |
| 2017 | 147 | 27 | $ 1,141,396 | $ 42,274 |
| 2016 | 159 | 27 | $ 360,718 | $ 23,360 |
| 2015 | 177 | 21 | $ 1,300,909 | $ 61,948 |
| 2014 | 194 | 56 | $ 1,987,648 | $ 35,494 |
| 2013 | 177 | 30 | $ 1,168,185 | $ 38,940 |
| 2012 | 206 | 89 | $ 2,343,273 | $ 26,329 |

Note: Processing statistics represent files processed as of November 2, 2022. Potential for additional Apple file processing and payments is possible as processing for 2021 continues.

## 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 ensure a production insurance plan that is responsive to the changing needs of the Ontario apple sector.

**Apple Crop Insurance, 2013 – 2022**

**(As of November 2, 2022)**

| Year | Accounts | Liability ($000's) | Total Premiums* ($000's) | Grower Share of Premiums ($000's) | Total Claims** ($000's) |
|---|---|---|---|---|---|
| 2022 | 134 | $ 95,146 | $ 15,178 | $ 8,301 | unknown |
| 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 |
| 2017 | 134 | $ 58,628 | $ 8,038 | $ 4,211 | $ 12,654 |
| 2016 | 142 | $ 49,843 | $ 8,632 | $ 4,516 | $ 2,835 |
| 2015 | 140 | $ 45,427 | $ 7,077 | $ 3,432 | $ 13,735 |
| 2014 | 143 | $ 41,128 | $ 7,868 | $ 4,112 | $ 2,828 |
| 2013 | 144 | $ 33,755 | $ 7,053 | $ 3,675 | $ 4,632 |
| **5-year average** (2017 - 2021) | **137** | **$ 70,267** | **$ 10,026** | **$ 5,313** | **$ 8,833** |

* 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.

The Ontario government has announced an increase in available funding for the Risk Management Program (RMP), from $100 million to $150 million, starting with the 2020 program year. RMP helps farmers manage risks beyond their control, like fluctuating costs and market prices.

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

Apple growers currently have access to two government cash advance programs through Agricultural Credit Corporation. Both 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 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 with the first $250,000 interest free and 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 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

Communications to the membership continue to be an important activity for the staff. While our newsletters were sent to the members, either by email or regular mail, 2021/2022 continued to have an increase in email communication informing and sharing information about the pandemic and impacts to the horticulture sector. The OAG also continued to distribute OMAFRA's *Orchard Network Newsletter* four times a year.

The OAG web site continues to be a central location for information. A Covid-19 Resources page continued to be updated as needed and is accessible under the Grower section. Additional information including newsletters, industry statistics and information are always available here as well. There is also a Classifieds section on the Grower section of the website.

### Summer Orchard Tour

On August 4th, 200 growers and stakeholders from across the province came together in Durham Region to network and learn. The OAG would like to extend a huge thank you to the sponsors who made this tour possible, our hosts Archibald Orchards & Estate Winery, Algoma Orchards, and Wilmot Orchards, the OMAFRA staff, tour leaders and each of our speakers.

## Worker Health & Safety

In partnership with Ontario Tender Fruit and Fresh Grape Growers, we updated the Infection Control and Prevention Policy for members in 2022. This document is an addendum to the previously provided Health and Safety Modules for the sector. The documents are developed by Worker Safety & Prevention Services (WSPS) with funding from the Government of Ontario.

## 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.

## Fire Blight Risk Maps

Fire blight is a very devastating bacterial disease of apple 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.

The 7-day weather forecast data from 72 sites, representing most counties in southern and eastern Ontario where apples are grown, was put into the Cougar Blight model, and updated 3 times per week during apple blossom time April 20 - June 12, 2022. Regional 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 960 unique pageviews over the risk period. The OAG sincerely thanks and acknowledges the OMAFRA apple team and GIS specialists for delivering this valuable service to the Ontario apple growers in 2022.

## Cost of Establishment and Production

The OAG will be working with OMAFRA specialists in 2022 to update this resource. The last update was in 2019 using 2018 costs and reflects current management practices being used by apple growers today.

### 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 60 members and uses text/chat group to continue their conversation and learn from each other daily. In June 2022, the group met in Niagara and toured Vineland Research & Innovation Centre, DeVries Fruit Farm, and Mountainview Orchards. Thank you to our sponsors NM Bartlett and Upper Canada Nurseries.

## 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. <u>Technology, Mechanization, Automation & Efficiencies</u>**

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. <u>Sustainable Practices</u>**

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. <u>Maximizing Quality & Minimizing Losses</u>**

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 University 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 be 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.

Data will be analyzed in the winter of 2022/23 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, 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.

**2.3.1 Efficacy of using Malusim and BreviSmart to determine the rate of chemical thinner**
This experiment is being 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.

**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.

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

Subject to reaching an agreement with the University of Guelph and NEWA, data collected in real-time from Onset weather stations in 3 to 5 Ontario orchards will be used to assess the benefits of using the Malusim and PTGM models to growers. The tree fruit specialist will 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, detail 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 Canadian Agricultural Partnership (OMAFRA) 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 tree survival and fruit quality and offer alternatives to chemical fumigants.

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

1. **Ontario Orchard Biocontrol Experiments**
    a. Compare soil characteristics, tree health, and tree growth between three fungal and bacterial biocontrol treatments and a conventional fumigation practice
    b. Evaluating the microbial composition of rhizosphere soil in each treatment
    c. Determine microbial species associated with ARD in Ontario, 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 the effect of rootstock germplasm on soil microbial composition and sensitivity to soil microbiome

**Experiment 1: Ontario Orchard Biocontrol Experiments**

The field research concluded in early October 2022 at three orchards in Norfolk County: one orchard is a high-density replant orchard, one is a medium-density replant orchard, and the third is a low-density replant orchard. There is now field data for three growing seasons, which have been statistically analyzed. Various analyses have been completed to assess tree growth, tree health, and soil composition. Determining soil microbial composition is yet remaining data to process and will provide an important context for interpreting the other data collected. The rhizosphere soil DNA analyses are currently underway; year 1 and 2 data should be processed in November 2022. We aim to have year 3 data

processed early in 2023. To date, the data has demonstrated that our bacterial biocontrol soil treatment had similar positive effects on tree health and growth as conventional soil fumigation.

**Experiment 2: Greenhouse Rootstock Experiments**
Two greenhouse experiments were conducted in the winter of 2021 and 2022. The experimental design was modified slightly in 2022 to improve our statistical interpretation of the results. Similar to the field experiments, various analyses have been completed to assess rootstock growth, health, and soil composition. Soil microbial composition and plant health are the remaining pieces of research to complete. Analyses of the 2021 rhizosphere soil DNA are currently underway, and we aim to have 2022 DNA data processed early in 2023. So far, the data has demonstrated differences in plant growth due to rootstock type and soil type (pasteurized vs. replant soil), but researchers have only seen one metric with an interaction between rootstock and soil.

Research updates are posted on the University of Guelph research blog at:
https://applereplantdisease.wordpress.com/.

## Incidence, timing of infection, and management of bitter rot in Ontario - Asifa Munawar, Stephen Reynolds, Cathy Bakker, Vivian Adams, Mary Ruth MacDonald and Katarina Jordan, University of Guelph, Kristy Grigg-McGuffin, and Katie Goldenhar, OMAFRA

Bitter rot, caused by *Colletotrichum fioriniae* 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 and few effective fungicides are registered in Canada. There are also reports from the USA of developing fungicide resistance in Colletotrichum isolates.

The objectives of the project are:
1) determining the incidence of bitter rot in Ontario orchards,
2) timing of fruit infection,
3) sensitivity of isolates to pyraclostrobin and captan, and
4) efficacy of different fungicides to better manage the disease.

**Objective 1:** The work on objective 1 is completed in the field season of 2019 and 2020. A summary of the post-harvest incidence of bitter rot is described here:
Thirteen orchards from four apple-growing districts in Ontario were surveyed in the fall of 2019 and 15 orchards from five districts in 2020 for the presence of bitter rot based on their previous history of the disease. In each orchard, 200 fruit were collected from twenty asymptomatic trees of two susceptible cultivars, 'Empire' and 'Ambrosia'. If an orchard did not have either one of these cultivars, 'Honeycrisp' or 'Gala' was used. The fruit was stored at 4-5 $^{o}$C for five months and then left at 20 $^{o}$C for two weeks and assessed thereafter for bitter rot symptoms. In 2019, the disease incidence ranged from 0-8% in district 1, 0-20% in district 2, and 0-6% in district 5. None of the fruit from orchards in district 3 developed bitter rot symptoms in storage. In 2020, the disease incidence ranged from 0-9% in district 1, 0-61% in district 2, 1-12% in district 3, 0-1% for district 4, and 0-8% for district 5. In both years, district 2 had higher disease pressure. Among the most scouted cultivars, Empire had a higher disease incidence than Ambrosia.

**Objective 2.** The work was carried out in the 2020 and 2021 field seasons. The timing of fruit infection was studied by weekly inoculation starting from the fruit set (fruit size 5 mm) and weekly collection of asymptomatic apple fruit from the selected orchard from 2020-2021. 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 fruit size, inoculum presence in the orchard, and favorable weather conditions. The symptoms were observed in the field starting from fruit size 32mm and at post-harvest.

**Objective 3:** The work on this objective was delayed due to a shortage of correct-size Petri dishes. In total, so far, 45 bitter rot isolates were tested for their sensitivity to pyraclostrobin and 27 isolates were tested for Captan using mycelial growth assays. The fungus was found sensitive to pyraclostrobin at low concentrations (<0.1ug/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. However, this conclusion is based on preliminary results, testing more isolates may change the outcomes. The work will continue in 2022-2023.

**Objective 4:** 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. 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. The results will provide more tools for Ontario growers to manage this disease.

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", efficiencies 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.

## Automated Fire Blight Detection and Digitization for Apple and Tender Fruit – Dr. Medhat Moussa, Cole Tarry, and Matthew Veres, University of Guelph, Kristy Grigg-McGuffin, and Wendy McFadden-Smith, OMAFRA

This project objective is to develop automated systems for the detection of fire blight. This system will be part of an automated farm digital library (AFDL) that will include precise information on every tree in an orchard. The proposed system will enable inspecting *every tree* at a frequency of 1 – 2 times/week or even higher. The results will be digitized in the AFDL, enabling comparison over time with IPM strategies and labour utilization.

Following the data collection strategy used during the summer of 2021, a revised system was developed to improve the quality and quantity of the collected data. The system consists of a computer, power source, RTK-GPS, mast, and three imaging sensors. While the system was initially developed to be pulled along the rows with a wagon, it was further improved to be mounted on the back of a truck, allowing us to drive along the rows of the orchard in a more controlled manner. Software was developed to synchronise data capturing from all sensors in the system, and both (a) images, and (b) RTK-GPS location data was saved into a database on the computer.

Tree *cankers* are a primary source of infection for the fireblight disease within orchards. To collect this data, the orchard was scanned in early Spring of 2022, prior to any foliage developing on the trees. Once the foliage has developed, identifying these cankers becomes much more difficult to the obstructive nature of the leaves. A total of 5040 images were captured and consists of 840 sets of images taken from all cameras. Three sets of images were collected of both sides of each tree as the data collection system moved past, gathering data on a total 140 trees.

Data collection further continued into the late spring and summer months. Image sets were collected on a bi-weekly basis of specific rows in the orchard, and every tree in the row was imaged, regardless of whether it had visible fireblight or not. This imaging strategy allows us to look back in time once fireblight has appeared on a tree, to attempt to identify it before it was visibly apparent to the OMAFRA specialists. An additional 4500 image sets (27,000 images) have been collected of the trees with foliage on them.

Following the distinction of the Early and Mid-Late season fireblight, it can be noted that the features of fireblight (or symptoms of fireblight) can differ significantly. While in the early season cankers may be visible, these become much more difficult to observe during the later stages of the year once the tree begins to bear fruit and leaves.

Two approaches are being investigated: one that focuses on detecting cankers in an image (or similarly, regions of the image that were labeled by OMAFRA specialists), and a second approach that tries to quantify the severity of fireblight symptoms, by counting the number of diseased leaves in an image. Both approaches require different labeling strategies, which in turn require different degrees of labeling efforts.

**Early Alert of Airborne Fungal Disease and the Determination of Fungicide Resistance in Several Southern Ontario Horticultural Crops using Air Sampling Monitoring – Michael Selah, Spornado Inc., Dr. Wendy McFadden-Smith, Erica Pate, and Kristy Grigg-McGuffin, OMAFRA**

The following is a brief overview of the preliminary results of the past two seasons of air monitoring for *Venturia inaequalis*, the fungal pathogen that causes apple scab. The purpose of this project is to provide information to growers that will allow them to better choose and time their pesticide use. In addition to molecular testing for disease detection, positive samples will be analyzed this fall, for the identification of fungicide resistant alleles in pathogenic spores. A final report summarizing all results, with discussion and conclusions will be generated this winter.

Air monitoring started June 21, 2021 and continued until October 4, 2021. There were four test sites, with two samplers deployed at two of the sites, and one sampler each at the remaining two sites. Samples were collected at 3–4-day intervals during the summer, and once a week in September and October. A total of 136 samples were analyzed by qPCR, and 4 positive results were identified. The first positive result was identified the first week of sampling (June 21). Positive samples were identified in 3 of the 4 following sample submissions. No positive samples were identified after July 5, 2021. It was hypothesized that the limited number of positives may have been influenced by low levels of wind in the orchard due to it being blocked by the trees when fully foliaged. Each of the three sites monitored had positive results during the season.

In 2022, the research team switched from using wind-only samplers, to samplers that comprise a solar powered fan to increase air passage through the collection cassette, when trees are fully foliaged. Sampling began April 28, 2022 and continued twice a week until September 26, 2022. A total of 98 samples were collected over 3 different sites, with 2 samplers installed at each site. The first positive result was identified on May 17, and there were positive samples periodically throughout the season. A total of 13 positive samples were identified throughout the season; each site had positive results.

**Using Genetic Tests to Confirm Herbicide Resistant Weeds – Kristen Obeid, OMAFRA Weed Management Specialist, Horticulture**

Since 2016, this project has created 20 genetic quick tests (more in progress) to assist in identifying herbicide resistance in 14 weed species and confirmed 152 new cases of herbicide resistance in Ontario crops. These tests deliver a diagnostic and a recommendation to the grower within the same growing season. Traditional resistance testing in the greenhouse can take from three months to a year to get results back to growers. Now, leaf tissue instead of seed is collected. DNA is extracted from the leaf tissue to determine if there is a change in the sequencing resulting in a mutation making the plant resistant.

Tests have been developed to differentiate between Brassica and Amaranthus (pigweed) species. Tests differentiating pigweed species have been instrumental in confirming new cases of waterhemp in Ontario, Manitoba, and Quebec. Once confirmed, the waterhemp is tested for Groups 2, 5, 9 and 14 resistances. Waterhemp has been found in 18 Ontario counties, 14 rural municipalities in Manitoba and 14 regional county municipalities in Quebec.

Testing is being completed in Ontario by Harvest Genomics (www.harvestgenomics.ca).

**Significant Results:**

- Waterhemp resistant to Groups 2, 5, 9, 14 and 27 in 4 counties in Ontario - Chatham-Kent, Essex, Lambton and Middlesex.
- Waterhemp confirmed in 3 new Ontario counties in 2022 – Dufferin, Niagara and Ottawa. Bringing the total to 18 (Brant, Bruce, Chatham-Kent, Dufferin, Elgin, Essex, Haldimand, Huron, Lambton, Leeds and Grenville United Counties, Middlesex, Niagara, Norfolk, Northumberland, Ottawa, Stormont, Dundas and Glengarry, Wellington and Wentworth).
- Multiple resistant waterhemp confirmed in asparagus, peppers, corn, soybeans, sweet corn and white beans in Ontario.
- In 2022, greater than 95% of waterhemp confirmations were G14 resistant compared to 76% G9 resistant.
- Hybrid species of waterhemp and green pigweed or waterhemp and redroot pigweed are being found when confirmation of species is requested. Initial testing in Quebec has found that the seed of waterhemp and green pigweed hybrids are viable; however, G9 resistance was not carried forward to progeny. More testing is required.
- Multiple resistant pigweed species (green pigweed and redroot pigweed) are commonly found in many horticulture crops for example: G2/G5 in pumpkins, potatoes, soybeans, strawberries, sunflowers and tomatoes and G5/G14 in carrots.
- Continued documentation of Canada fleabane resistant to G9 in apples, grapes, blueberries, strawberries, carrots, onions and pumpkins.
- New G14 resistant common ragweed found in soybeans in Prescott and Russell United counties. With several other locations yet to be confirmed in Ontario. Testing is being completed by MAPAQ. At this time, G14 resistant common ragweed has been found in 6 regional county municipalities in Quebec.

This testing has been instrumental in documenting new cases of herbicide resistant weeds. In 2022, 91% of the fields tested in Ontario were resistant to at least one herbicide group. Once confirmed producers were provided the resistance profile enabling a change in management to mitigate spread. Producers, agri-business, and consultants that participated in the project were pleased with the timely results, welcomed the in-season management recommendations and highly value this service.

There are many more undocumented cases of herbicide resistant weeds in Canada. The resistance mechanism is unknown for most of them. The major concern is their distribution and economic impact for producers. Knowing where resistant biotypes are located will improve management and maintain the longevity of our crop protection tools.

Project partners, along with the OAG, include AAFC, AAFC-PMC, Bayer CropScience Inc., FMC Canada, FVGO, MAPAQ, OFVGA, OPVG, and Syngenta Canada Inc.

**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 receives funding through the Agri-Science Program and ends 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.

Below is a chart of the plantings:

| Year | Sites | Selections |
|---|---|---|
| 2012 | 11 | 7 (AAFC/SVC) |
| 2015 | 11 | 5 (4 AAFC/SVC<br>+ Evangeline AAFC/NB) |
| 2016 | 10 (2 new,<br>3 declined) | 4 (3 AAFC/SVC<br>+ 1 from U Minnesota) |
| 2018 | 2 larger plots | 4 best from 2012-2015 |
| | 7 (to date) | 7 new (2 from VRIC,<br>4 from AAFC/SVC,<br>1 from AAFC Ontario test plots (2000)) |
| 2019 | 10 | 1 (AAFC/SVC) |
| 2021 | 10<br>8 | 5 (AAFC/SVC)<br>9 (Star Fruit/France) |

## 2021 Apple Breeding Program Update - Rachael LeBlanc, Vineland Research and Innovation Centre

### From the Orchard

The 2022 growing season was another good year for Vineland as fruit was evaluated on over 10,000 trees. A large assortment of fruit with many characteristics (size, colour, shape, flavour, etc.) continue to be observed within the population. Here are some highlights of achievements this year:

- 2,900 trees were added to the Test 1 orchard on the Vineland research farm
- 18 genotypes were advanced to Test 2, bringing the total number of cultivars in Test 2 to 93
- Test 3 trialing network was expanded in Ontario. There are now two growers in each district across the province:
    - Up to four selections planted at eleven sites in Ontario
    - Additional selections were propagated for Test 3 and will be available for grower plantings in 2023
- 11 crosses were made; seeds are currently being extracted in preparation for stratification and genotyping
- Three more selections have been sent to CFIA for virus-indexing, bringing the total to eight cultivars in virus clean-up
- Preliminary controlled atmosphere (CA) storage performance was evaluated for four selections:
    - Consumer preferred flavour was maintained during storage
    - Additional experiments will be performed in 2022-2023 to evaluate texture during CA storage




### Sensory Profiles and Consumer Liking

This year was very exciting as it was the first time apples from the breeding program were evaluated by both Vineland's Sensory Panel and consumers from the Greater Toronto Area:

- 35 apple selections from the breeding trials and four commercial cultivars were profiled by Vineland's trained panel and described in terms of aroma, flavour, taste and texture characteristics
- Based on the results from the panel evaluations, 15 selections (Vineland and commercial) were selected to be evaluated by consumers in Toronto
- 227 consumers evaluated the apples for liking in November 2021
- Selections are coded to protect their identity until their commercial potential is determined

**Consumer Acceptance**

The overall liking for Vineland apple selections showed that Apple 1 was the most liked cultivar, with higher liking than Honeycrisp, the top performing commercial cultivar, and Gala. Ten of the remaining Vineland selections (Apples 2 - 11) were liked as much as Honeycrisp and more than Gala.

Consumers were grouped based on liking of apples using cluster analysis. Four unique consumer liking groups were identified:

- Consumer Group 1 (19%): Like apples with sweetness and acidity, along with lemony aromas, juicy, crisp and chewy textures
- Consumer Group 2 (14%): Dislike apples that are mealy, have high acidity and thick skins
- Consumer Group 3 (41%): Like apples with high sweet taste and very low acidity
- Consumer Group 4 (26%): Like apples that are high in crisp and juicy textures

The Vineland varieties performed well with consumers

- Best selections that appeal to all consumers seeking juicy, crisp, sweet, and aromatic apples are Apple 1 and Apple 2
- Best selection that appeals to consumers seeking crisp, tart, and flavourful apples (Groups 1 and 4) is Apple 2
- Best selections that appeal to consumers seeking very sweet apples (Group 3) are Apple 1 and Apple 4

**Commercial pipeline and partnerships**

The Vineland Business Development team has been working in parallel with researchers to develop a commercialization plan and build industry relationships in preparation for the first elite apples from the breeding program to be selected and set on a path to market. 2020/2021 was focused on understanding and evaluating potential business models, while 2022 sees a shift toward relationship building, specifically seeking and securing a collaborator(s) with the necessary skills and experience to bring Vineland apples to growers and consumers across this country 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 – an apple tree was enclosed in a portable greenhouse and used for observations of OBLR larvae. Sleeve cages were placed on this tree as well as a nearby tree (outside the greenhouse) during 2021 and 2022. Larvae were placed within these cages and observed hourly over several days. Behaviors were more readily observed in 2021 compared with 2022 as the temperatures in the greenhouse were extremely high (~45 C) when the larvae were introduced. Mortality of larvae was higher in 2022 as a result. Larvae released on the upper surface of the leaf were observed to move to the underside of the leaf in the greenhouse and to seek shaded leaves to create their leafroll. The impact of these behaviors on larval survival will be explored during 2023.

Objectives 2 and 3 – these 2 objectives were studied concurrently in a series of experiments. Larvae were exposed to three products (DiPel, Altacor and Confirm) plus a water control (total of four treatments), at 4 timings in relation to heat wave exposure: immediately before the heat wave, 3 days into the heat wave, immediately after the heat wave and 3 days after the heat wave. The heat wave exposure was created by having a separate incubator set to fluctuate from 27-33°C, over a 24-hour period. Larvae were placed in the heat wave incubator for 5 days. The control rearing conditions were created using an incubator which fluctuated from 18-22°C, over a 24-hour period. Freshly hatched larvae were collected and placed individually on artificial diet in 0.5-ounce cups and into the control incubator until they reached the 3rd instar stage. At this time half of the collected larvae would be treated with product (or water) and placed in the heat wave incubator while the other half were placed in a second control incubator. Following their heat wave exposure, the larvae were moved to the second control incubator for an additional week. Each treatment used 35-38 larvae and the entire set of experiments was repeated 3 times. Mortality of larvae was checked immediately before exposure to the heat wave, immediately after the heat wave, 3 and 7 days after the heat wave. Any larvae moving when gently prodded with a probe was deemed ‘alive’. Larval stage was recorded at these times and from each treatment, a set of 5 larvae were removed and their weight and head capsule size measured. Preliminary analysis of the data is disclosing a striking difference between larvae exposed to the heat wave versus those that are not. Those exposed to the heat wave are developing faster than those not exposed to the heat wave thus reducing the window of opportunity for growers to apply product on younger, more susceptible, larval stages. Application timing of the products is reinforcing this observation. A thorough analysis of these data is underway. Future experiments will repeat this series of treatments using 2nd instars. Molecular evaluation of these larvae is at the protocol development stage.

Objective 4 – during 2021, the student worked to develop a protocol to apply products on a single branch. There were several challenges encountered due to the small volume to be applied. Further development of the protocol did not occur during 2022 owing to the high mortality of the larvae within the cages.

Objective 5 – this objective has not been initiated yet.

**Optimized Multi-Task Netting Systems for Next Generation Orchards - Gérald Chouinard, IRDA**

The objective of this project is to help the Canadian apple industry cope with labour and pesticide challenges. By using exclusion netting, narrow fruiting walls, and mechanized operations, it is aimed at developing an integrated system of precision farming that will facilitate the production of high-quality fruits, greatly reduce pesticide use, and protect crops from climatic change challenges (hail, exotic pests, etc.).

Netting structures are fully deployed in the experimental orchard of the Research and Development Institute for the Agri-environment (irda.qc.ca) in St. Bruno, Quebec and data collection is currently under way to:

1. Measure the effects of mechanical pruning on apple trees trained as a narrow fruiting wall orchard system suitable for mechanized pruning and harvesting
2. Measure the effects of multi-task exclusion systems on insecticide, fungicide and herbicide use, protection from climatic events such as hail and frost, and fruit quality.
3. Investigate the performance of single-leader trees vs multi-leader trees.

The activities carried out in 2022 also includes the design of a mechanically operated opening/closing system to reduce labor cost associated with net manipulation.

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, the Canadian Horticultural Council and industry contributors. The OAG would also like to recognize and thank the Apple Marketer's Association of Ontario (AMAO) for their funding contribution.

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

Results and data are currently being analyzed for the 2021-22 season. Updates from 2020-21 storage season follow.

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

#### 1.1. 'Honeycrisp' – bitter pit prediction

Three temperature regimes for seven 'Honeycrisp' orchards with varying susceptibility to bitter pit were evaluated for the 2020 storage season. In collaboration with Dr. Chris Watkins from Cornell University, along with research colleagues in Maine, Maryland, Michigan, Pennsylvania, and Washington state, the

*Passive Method* to predict bitter pit in 'Honeycrisp' apples was evaluated for a second season. Data from the past 2 years are being analyzed, but these predictions were not consistent among regions or orchards.

### 1.2. 'Gala' – conditioning at 10°C

'Gala' apples treated with 1-MCP at harvest time were held in CA storage (1.5% $O_2$ + 1% $CO_2$) at 0.5°C for 8 months. Half of the apples were held at 10°C for the first week of CA storage, while the other half went immediately into 0.5°C. Initial temperature conditioning at 10°C significantly reduced internal and stem-end browning to 9.9% incidence, compared to 21.6% with no temperature conditioning (immediate 0.5°C). There were no effects on fruit firmness and other quality attributes.

### 1.3. 'Ambrosia' – conditioning at 10°C

'Ambrosia' apples treated with 1-MCP at harvest time were held in CA storage (1.7% $O_2$ + 1.2% $CO_2$) at 0.5°C for 5 and 8 months. Half of the apples were held at 10°C for the first week of CA storage, while the other half went immediately into 0.5°C. Initial temperature conditioning at 10°C significantly reduced internal and stem-end browning to 1.5% incidence, compared to 12.6% with no temperature conditioning (immediate 0.5°C). There were no effects on fruit firmness and other quality attributes.

### 1.4. 'Ambrosia' – delayed cooling to 0.5°C

'Ambrosia' apples treated with 1-MCP at harvest time were held in CA storage (1.7% $O_2$ + 1.2% $CO_2$) at 0.5°C for 8 months. Apples were initially held at 3°C for 0, 1, 2, or 4 weeks prior to 0.5°C. Delayed cooling at 3°C for 4 weeks significantly reduced internal and stem-end browning to 5.6% incidence, compared to 10-14% with no delayed cooling (immediate 0.5°C). All delayed cooling regimes reduced fruit firmness by 0.2-0.4 lb, while 4 weeks at 3°C also slightly increased greasiness severity and reduced titratable acidity.

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

### 2.1. 'Honeycrisp' – SafePod™ technology, ~1% $O_2$

Postharvest 1-MCP treatment before or after storage was evaluated for 'Honeycrisp' apples in combination with low oxygen (3 vs ~1% $O_2$) at 3°C, plus holding for 14 days at room temperature. Low oxygen at ~1% was based on fruit respiration measurements using dynamic SafePod™ technology. After 8 months of storage, apples held in ~1% $O_2$ had no internal storage disorders versus 9% incidence in those held in 3% $O_2$. Furthermore, apples held in ~1% $O_2$ had less greasiness (8 vs 65% incidence, respectively). 1-MCP treatment at harvest time resulted in more internal storage disorders and ~0.5 lb greater firmness, compared to apples not treated with 1-MCP or treated upon removal from storage.

### 2.2. 'Ambrosia' – SafePod™ technology, <1% $O_2$

Postharvest 1-MCP treatments before or after storage were evaluated for 'Ambrosia' apples in combination with low oxygen storage (1.2 vs <1% $O_2$) at 0.5°C, plus holding for 14 days at room temperature. This was the second year of study and a lower oxygen comparison was used, 1.2% instead of 1.7% as in the past year. Low oxygen at <1% was based on fruit respiration measurements using dynamic SafePod™ technology. After 8 months of storage, apples held in <1% $O_2$ (low of 0.6%) had significantly less internal browning than those held in 1.2% $O_2$ (16 vs 58%, respectively). Furthermore, 1-MCP treatment at harvest time resulted in significantly higher incidence of browning (60%), compared to fruit not treated or those with 1-MCP after storage (37 and 44%, respectively). Apples held in <1% $O_2$ had ~ 0.6 lb greater firmness than those held in 1.2% $O_2$.

### 2.3. 'Ambrosia' – low $O_2$ concentration

Following along with 2.2 above, oxygen concentrations of 1.7 vs 1.2% were compared for 'Ambrosia' apples stored at 0.5°C with 1% $CO_2$ for 6 months. Apples held in 1.2% $O_2$ had greater firmness (+ ~1 lb) and less internal browning than those held in 1.7% $O_2$ (31 vs 47%, respectively). There was also slightly less greasiness in 1.2% $O_2$, compared to 1.7%.

### 2.4. 'Ambrosia' – $CO_2$ concentration with low $O_2$

Similar to 2.3 above, concentrations of 1 vs 2% $CO_2$ were compared for 'Ambrosia' apples stored at 0.5°C with 1.2% oxygen for 6 months. Apples held in 1% $CO_2$ had significantly less internal browning than those held in 2% $CO_2$ (1.5 vs 8%, respectively). There were no effects on fruit firmness or other quality attributes.

### 2.5. 'Gala' – low $O_2$

'Gala' apples with or without preharvest 1-MCP application (Harvista™) were treated with or without postharvest 1-MCP (SmartFresh™) before or after CA storage with low oxygen (1.5 vs 0.6% $O_2$) at 0.5°C. Data from the past two storage seasons were analyzed and a scientific paper published – *Timing of ethylene inhibition affects internal browning and quality of 'Gala' apples in long-term low oxygen storage*, in the journal Frontiers in Plant Science.

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

### 3.1. $I_{AD}$ readings from DA meter

Collaboration with research colleagues at the University of Minnesota and University of Maine, to investigate the use of Delta Absorbance measurements ($I_{AD}$ from) for evaluating 'Honeycrisp' maturity and associated storage disorders, continued into 2021 with further analyses of data from past seasons. This led to a scientific paper titled *'Honeycrisp' apple maturity, quality and storage disorders according to interior and exterior tree canopy position*, which has been accepted for publication in the Journal of the American Pomological Society. Soft scald and soggy breakdown incidence did not vary between the tree canopy positions, but bitter pit was greater in the interior canopy compared to the exterior fruit in Ontario.

**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 is 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 – data to develop a revised degree day model was collected from 2018-2020 inclusive. The developed model was shared with collaborators to distribute to their industry partners. A FactSheet has been developed and is being translated into French. Following this, it will be distributed to collaborators and industry partners.

Objective 3 – following analysis and discussion of the experiments conducted in 2021, a repeat of the experiments occurred in 2022. In BC and NS, the experiment was to use the host volatiles in a mass trapping strategy. Results from 2021 showed promise in both provinces to reduce damage from leafrollers by approximately 3%. It is hoped that results from 2022 will corroborate these initial findings. In Quebec, a final year of testing the host volatiles in conjunction with synergists for codling moth occurred. In ON during 2021, host volatile lures were deployed after first flight and in orchards where pesticides were being used. This resulted in very low captures and a lack of confidence that a true test of the lures occurred. In 2022, additional orchards using softer management strategies were sought to try and improve trap captures and provide a better evaluation of the host volatiles to attract leafroller species. Data from BC has been received by the project lead for analysis. Receipt of data from QC and ON is pending. Once all data is in hand, analysis and final report writing will occur.

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# NATIONAL REPORTS

## CANADAGAP REPORT

CanadaGAP® is a food safety program for companies that produce, pack, repack, store, wholesale and broker fresh fruits and vegetables. The program is designed to help implement effective food safety procedures within fresh produce operations. Apple growers, packers and wholesalers across Canada have been active participants in the program since 2009. In Ontario, approximately 100 apple growers and packers are CanadaGAP-certified.

In 2022 several new projects were undertaken at the same time as the world began to emerge from the darkest days of the global coronavirus (COVID-19) pandemic, and business returned to a 'new normal'. The most important development was the creation of two new non-GFSI-recognized certification options for CanadaGAP program participants whose buyers may not require full compliance with GFSI. The new options, E and F, are very closely modeled on the GFSI-recognized options (C and D), with two important differences:

- Unannounced audits provide 2-5 business days' notice to the certified company (versus no advance notice for GFSI-recognized options)
- The passing score on the audit is 95% (versus 100% compliance required for GFSI-recognized options).

In all other respects, including all food safety elements as well as food fraud, food defense, food safety culture, environmental monitoring, etc. the new certification options are identical to GFSI-recognized certification. To date more than 60 companies are enrolled in the new certification options.

Other CanadaGAP activities in 2022 included:

- In partnership with the Fruit and Vegetable Growers of Canada (FVGC), CanadaGAP began work on an AAFC-funded project to expand the scope of the Greenhouse Food Safety program. It is expected by April 1, 2023 that many more greenhouse-grown products will be able to seek certification under the CanadaGAP program – such as those producing and packing melons, berries, various root vegetables, cruciferous crops and legumes.
- CanadaGAP also 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.
- A new certification body, Control Union, was approved and licensed to begin offering CanadaGAP audits and certification in 2022.
- The program successfully concluded the 40-month Maintenance of Government Recognition by CFIA and provincial partners.

This year brought continuing challenges for operations maintaining compliance with GFSI-recognized certification. Increasingly stringent food safety expectations continue to prevail. New rules introduced by the Global Food Safety Initiative (GFSI) for companies certified for "Production and Packing" under CanadaGAP Options B and C meant that starting April 1, 2022 those operations will require both harvesting and packing activities to be audited each year. For some certified operations, depending on the timing of their activities, that will mean undergoing two audits per year. Further detailed information about the changes made to 2022 requirements is available on the CanadaGAP website at www.canadagap.ca.

CanadaGAP will be publishing Version 10 of the Food Safety Manuals and CanadaGAP Audit Checklist in 2023. Watch for notification of the changes in January or February 2023. The implementation date for the new version will be April 1, 2023.