

Ontario Tree Fruit Innovation and Technology Roadmap

Adverse Weather

Growers overwhelmingly said that weather technology can help them maintain production levels by reducing their risk of perils and ensuring crop quality and volume. Most tree fruit growers in Ontario use tile drainage and/or irrigation of some type currently. Growers have identified the need for the following technologies specifically protecting their crops from adverse weather to reduce crop loss.

Evaluating New Technologies – Adverse Weather

	Feasibility and cost	Implement	Labour Reduced	Changes in production	Training for staff	Impact on risk of COVID-19 Transmission
Identified Technology	low, medium, high	easy, medium, hard	% estimate	easy, medium, hard	none, medium, high	none, low, medium, high
Drainage	high	easy	NA	easy	low	low
Trickle irrigation equipment	high	medium	20-30	easy	low	medium
Frost protection	high	easy	NA	easy	low	low
Frost protection remote controls	low	easy	10	easy	low	low
Hail protection	high	medium	NA	easy	low	low

Growers emphasized in the survey the importance of technologies designed to protect tree fruit crops from adverse weather. After soil preparation, nutrition and organic matter has been achieved, growers need to plan for other factors that will affect their orchards in the future.

Drainage

Current Status - In Ontario, unlike many fruit tree growing areas around the world, we have sufficient rainfall in most years. Drainage is key to remove standing water quickly after snow melt and heavy rains. Drainage is usually installed prior to planting if the rows are marked-out but can also be added shortly after planting.

Feasibility of Implementation - Traditionally installed by Contractors, so implementation has been easy.

Impact on Labour - Has minimal impact on labour productivity, however labour is needed on occasion to make necessary repairs to tile drains.

COVID-19 Mitigation Risk - Minimal impact on mitigating the risk of exposure and transmission of COVID-19

Need for Change, Research and Training - Skilled labour is needed on occasion to make necessary repairs to tile drains.

Trickle Irrigation

Current Status - In most fruit tree growing areas this is the most critical issue after planting. There is nothing worse than planting a new orchard and then ending up with only a few inches of growth because of dry growing conditions. However, as soon as irrigation starts, the weeds will flourish so there will be an immediate need for weed control. If mechanical weed control is to be used with trickle irrigation, the trickle lines need to be attached to a trellis above the ground where the soil is to be tilled for weed control. Growers are using single irrigation lines for apples. Overhead watering guns are the main method of irrigation for tender fruit growers however, some are transitioning to trickle irrigation. There are three common methods of trickle: standard lines with emitters, sub-surface lines with emitters and lines with 2-foot risers that sprinkle a pattern in the root zone.

Feasibility of Implementation - is often installed by the grower with the help of the supplier. Initial installation requires a crew to make connections and lay out the plastic hose. Overhead irrigation guns are typically installed in the fields each year by a three-man crew of farm workers that move reels and pipes around the field from the water source.

Impact on Labour - This technology will save labour if it replaces solid set pipes and travelling water guns, especially during a dry growing season.

COVID-19 Mitigation Risk - The implementation of trickle irrigation can reduce overall labour requirements for orchard operations therefore implementation can lower the overall risk of COVID-19 exposure and transmission for orchard operations.

Need for Change, Research and Training - Implementation and operation of the control system would require knowledge and training. Staff training is needed to know how to check pumps and filters at the water source, monitor the hose for leaks and plugged emitters.

Frost and cold winter weather protection

Current Status - In Ontario, it is necessary to protect tree fruit crops from extreme cold temperatures for eight months of the year from late September to late May. Extreme cold temperatures during winter can kill trees, especially at a younger age. A spring frost typically will damage the current season's crop. There are a few methods of protection including frost fans,

vertical air drains and portable heaters that are attached to tractors and driven throughout the orchard. Wind machines and frost fans are the most common method to prevent cold temperature extremes. Currently there are approximately 13,000 to 15,000 acres of horticultural crops such as grapes, tree fruits, field flowers and berries that are protected by equipment to mitigate frost damage.

Feasibility of Implementation - Frost fans and vertical air drains are typically installed by the dealer. Portable burners are attached to a tractor and no install is necessary. The costs can be high, but it only takes 1 or 2 frost/cold weather events to repay the investment.

Impact on Labour - Frost fans have automatic controls for starting and stopping, while vertical air drains can be run by a tractor PTO or independently. An operator is needed to ensure the machines start. A new technology for wind machines is a monitoring and control system that can be operated with a smartphone.

COVID-19 Mitigation Risk – Minimal impact on mitigating the risk of exposure and transmission of COVID-19.

Need for Change, Research and Training - Minimal training is required except by the owner/operator.

Hail Protection

Current Status - Hail events are destructive for tree fruit crops; they are typically isolated weather events in localized areas. Hailstorms are isolated to a couple of square kilometres, but large hailstorms have devastated the tender fruit and apple crops causing millions of dollars in lost revenue. Hail netting and hail cannons are now being used in some orchards. Hail netting can also provide shading to help reduce sunburn on fruit and heat stress on the tree.

Feasibility of Implementation - Netting is a labour intensive, costly undertaking for most growers, but it might only take 1 or 2 hail events to repay the investment. Hail cannons are easier to install and less expensive.

Impact on Labour - Some labour might be needed to remove the net every fall and re-apply again in the spring. Hail cannons would require routine inspection either by the grower or the dealer.

COVID-19 Mitigation Risk - Minimal impact on mitigating the risk of exposure and transmission of COVID-19.

Need for Change, Research and Training - Minimal training is required except by the owner/operator. Implementation would require some operational/process changes.

Excessive Wind Protection

Current Status - This can be problem for growers, especially for heavily cropped apples on trellis and can cause extensive damage by breaking and toppling the rows. Young trees with small root systems have also been pushed over especially if the ground is soft from excessive rainfall.

Feasibility of Implementation - Trellis supports must be engineered/constructed strong enough to prevent high winds from causing damage. Trellis systems are expensive but also necessary for high-density systems for training and supporting the weight of the fruit.

Impact on Labour - Once the trellis is installed, there could be a small amount of annual inspection of the system likely done by 1-2 farm workers.

COVID-19 Mitigation Risk - Minimal impact on mitigating the risk of exposure and transmission of COVID-19.

Need for Change, Research and Training - Minimal training is required except by the owner/operator and perhaps one worker.