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# FARMING IN A CHANGING CLIMATE

Melisa Luymes, Headlands Ag-Enviro-Solutions

> **Farmers are always at the whim of Mother Nature and what she has in store for us. But facing a changing climate, we will need to play more of an intervening role going forward. We'll have to use all the tools we have in order to keep farming.**
>
> **Amy Ouchterlony**
> Fiddle Foot Farm

While farmers have always had to adapt to changing weather, year to year, global shifts in climate patterns are predicted to have significant consequences for our local and global food systems, impacting how and where we grow food. But there are several ways that farmers are meeting these challenges. We're all in this together—farmers and eaters alike—and we are all a part of the solution.

Food and farming depend on water. Around the world, many of our fruit and vegetable producing regions, like California, are facing major droughts and dwindling water supplies for crop irrigation. The United States Environmental Protection Agency (EPA) also predicts more wildfires and a sea level rise that would threaten their coastal highways and airports.[1] As California supplies the majority of Canada's broccoli, strawberries, lettuce, carrots, and almonds, Canadian consumers will feel these climate impacts, likely in the way of rising costs and reduced availability of produce.[2]

Here in Ontario, and especially in the Greenbelt region, we might welcome some warmer weather. However, it is also predicted that we will experience more variable and wetter conditions in the spring and fall, more freeze-thaw cycles in the winter, and hotter and drier summers, punctuated with more powerful summer storms.

While warmer weather might allow us to grow new kinds of crops or develop agriculture in northern Ontario, wet spring conditions can delay planting, drought and hail reduce crop yields, and without deep freezes in the winter, pests and diseases become more rampant. Hotter summers put livestock and farm workers at risk, seasonal disruptions impact native pollinators, and flash storms or flooding wash away soil, which creates water quality concerns and can damage fields or equipment.

In 2020, weather varied across the province: some areas were damaged from summer storms, hail and flooding, and others suffered from drought. A spring heat wave followed by late season frost destroyed transplants and an asparagus harvest. The spring before that, over 300,000 acres in Ontario could not be planted due to the spring rains.[3] The freeze-thaw cycles the winter before killed 70% of the wheat crop in most parts of the province.[4]

"Every single year we're having a year like none other," says Amy Ouchterlony, of Fiddle Food Farm. "Older farmers tell me about the one terrible growing year that stood out for them, but now every year has serious challenges for farmers." To truly understand what the impacts of a changing climate might be and what farmers are doing to adapt, let's meet four farmers from around the Greenbelt.

1 United States Environmental Protection Agency, 2016 2 CBC News, 2015 3 Agricorp, 2019 4 Ontario Farmer, 2019

## Cathy and Marvin McKay
### Nature's Bounty Farm (Port Perry)

In 1980, Cathy and her husband purchased a 100-acre property in the Oak Ridges Moraine near Port Perry and planted apple trees. Nature's Bounty Farm is now a thriving orchard specializing in 'pick-your-own' apples and some of the original McIntosh, Cortland, and Northern Spy trees are still producing. The couple have since planted 14,000 trees of newer varieties like Honeycrisp and Gala. Cathy is currently the Chair of the Ontario Apple Growers.

Much of southern Ontario has a great climate for apple production; but as the climate changes, so does apple production. While apple farmers have long been mitigating the impacts of diseases and pests, they are using new technology to adapt to drought, frost, and hail.

Cathy McKay with Manager Rob Alexander
*Photo provided by Melisa Luymes*


Nature's Bounty Farm
*Photo provided by Cathy McKay*

"Heat makes sweeter apples and tender fruit," says Cathy. "But trees are stressed by drought. By the end of July 2020, we received less than a quarter of the rain we normally would have by then." Thankfully, August brought rains to the Port Perry area, but other Ontario orchards were not so lucky. Many apple farmers have set up irrigation systems to ensure their crops receive water if the rains don't come.

Apple blossoms are sensitive to frost. In March 2012, an early heat wave woke up the apple trees and a subsequent frost destroyed the apple blossoms, reducing Ontario's apple crop by 80% that year.[5] Farmers can protect their orchards from milder frosts by using frost fans, large fans that keep the air circulating within an orchard to prevent frost from settling into the blossoms. These fans can protect up to 10 acres of trees, but cost up to $40,000, says Cathy.

Hail is difficult to predict and it can destroy a crop within minutes. Some farmers are using hail netting, fine mesh installed above the trees to protect them, and others have claimed success with hail cannons that, while annoying neighbours with thunderous blast every few seconds, generate shockwaves that can turn hailstones into slush mid-air.

## FARMING IN THE FUTURE

There is no easy technological fix that wholly protects agriculture from climate change. But there are several ways that technology can help us mitigate and adapt to a changing climate. For instance, better weather forecasting instruments will give farmers more time to prepare for weather events. Several companies are developing small autonomous machines that could do precise planting and mechanical weeding without disturbing the soil. This would protect healthy soil microbes that are negatively impacted by conventional tillage. Technology may also help us manage soil erosion and flooding by controlling the flow of subsurface water in drainage systems using soil moisture sensors or weather station data. Farms create renewable energy, as well. Many barns and farm buildings have solar panels on the roof and electricity can be made from farm and food waste through anaerobic biodigesters. As electric vehicle technology improves, farmers would start using electric tractors, reducing fuel consumption and carbon emissions. The cost of developing and purchasing technology to protect Ontario's food production comes at a cost that is not easily recoverable from the marketplace.

5 The Star, 2012

## Brad and Carrie Nimijohn
### Braelane Farms (Milgrove)

Brad is the fourth generation on his Hamilton-area farm. His wife, Carrie, also manages a farm-supply business there. They grow corn, soybeans, hay, wheat, and other small grains. They also do field operations for their neighbours—about 4,000 acres in all. These field crops are susceptible to the droughts, intense storms, and changing seasonal norms of a changing climate. And the Nimijohns are already seeing the impacts.

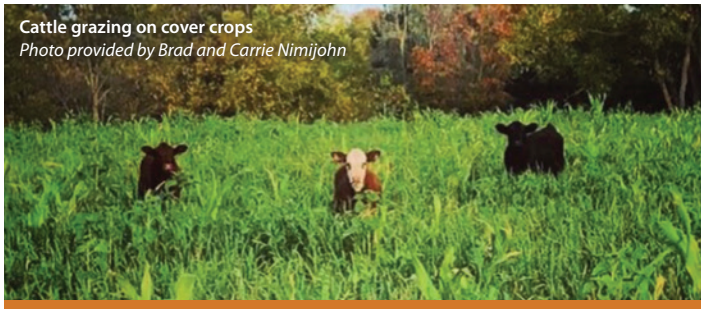
"Our soils around Hamilton are sandy and quite susceptible to drought," says Brad. They've recently invested in irrigation equipment, but the Nimijohns are focusing on building the soil's organic matter levels, which increase the soil's ability to retain water. They are also improving the soil's health in other ways: implementing no-till planting to reduce soil disturbance, growing small grains and hay that increase the diversity of their crop rotation, planting cover crops in the fall after harvest that protect the soil, and applying organic amendments, as well as cattle manure, to improve the soil quality.

Brad, Carrie, Sam, and Owen
*Photo provided by Brad and Carrie Nimijohn*

## BUILDING SOIL HEALTH

Improving the health of our soils can help with both climate change mitigation and adaptation. Healthy soil can act as a sponge that holds water, carbon and nutrients. Healthy, living soil can be maintained through soil health practices like keeping it covered with a diversity of plants, leaving it undisturbed, and feeding it.

To learn more, read **Greenbelt Farmers: Sustaining Soil Health**. This report tells the stories of 14 farmers in the region who are using a variety of practices to improve the health of their soil, and takes an in-depth look at soil degradation and why soil health matters.



**Cattle grazing on cover crops**
*Photo provided by Brad and Carrie Nimijohn*

The farmers featured in this report are improving soils through regenerative agriculture, including:

- Growing cover crops, like oats, peas, and radish, which are planted in the fall to keep the soil protected over winter and into the spring;
- Rotating where their crops are grown each year so that there is plant diversity;
- Minimizing soil disturbance, through growing perennial crops (apples, agro-forestry, pastures) or no-till planting techniques; and,
- Feeding the microbes in the soil with manure from cattle or compost.

"I've seen some of our fields pull through droughts when neighbouring fields didn't," admits Brad, who attributes the win to their soil management. And while regenerative agriculture may have short or long-term payoffs, this management can cost a farmer a lot of time and money, often requiring specialized equipment.

The Nimijohns also raise beef cattle that graze on pasture outside. Increased summer heat is especially stressful for livestock, even those raised indoors in climate-controlled barns. Drought impacts pastures and reduces the yield of hay fields and other feed crops, requiring farmers to buy and transport cattle feed from other areas.

The timing of rain is critical, and too much rain at the wrong time is also a problem. Across most of the province, corn is planted in early May and harvested in late October, so field operations can be delayed if there is too much rain at those times, as was the case in 2019. Wheat, on the other hand, has more flexibility due to a much longer planting window, from September to October, and is harvested in July.

Another alternative is growing perennial crops, like hay (alfalfa and grass). This crop is cut, harvested, and regrows and it can provide a crop for several years without needing to be re-planted or disturbed. The hay is dried and compressed into bales as feed for cattle, not only their own cows, but they have joined a local hay marketing co-operative that has sold their bales to drought-stricken areas of Canada, and even as far as the Middle East! Since farming depends on water, Brad says, the global food economy of the future is going to be led by areas that have access to water.

## Amy Ouchterlony and Graham Corbett
### Fiddle Foot Farm (Mulmur)

Amy and Graham grow over 60 varieties of fruits and vegetables on 5 ½ acres of an organic and biodynamic market garden on the Niagara Escarpment south of Collingwood, which they sell through local farmer's markets and a Community Supported Agriculture (CSA) model.

Neither of them were raised on a farm, but it was their shared concern for the environment that drew them to agriculture 15 years ago. "We were concerned with the environmental impact of our food," says Amy, who left her job as a high school science teacher. "When we started, we wanted to reduce our environmental impact, but now we see that we can actually improve the environment through regenerative agriculture."

Along with several other farmers in Ontario, Fiddle Foot Farm signed the National Farmers Union's **Climate Action Pledge** to commit to climate-friendly farming. Through planting cover crops, rotating a diversity of vegetables, minimizing tillage, and applying the composted manure of the animals they have on the farm, the soil at Fiddle Foot Farm is healthy and sequestering carbon.

Fiddle Foot Farm has seen the impacts of milder winters. Without an extended period of deep-freezing temperatures in the winter, pest populations increase and that often means more time and costs spent covering plants to protect them, or it might mean they stop growing certain crops altogether.

When a wet spring delays planting, they have begun to cover areas of the field with hoop houses (think portable greenhouse) to manage soil conditions, warm crops up earlier, and 'extend' the growing season. They also begin many of their vegetables indoors in greenhouses and later transplant them outside when the fields are ready. But that doesn't always work—an early heat wave in May 2020 caused transplants to be stressed before they were able to develop large root systems, so they had to irrigate with drip tape immediately or risk them dying off. Drip tape is like a plastic water hose with holes that is placed along the plant rows and deposits water next to the plant. This is quite labour intensive but conserves more water than typical overhead irrigation sprinklers.

"We've really focused on managing the soil on the farm," says Amy. "And now we want to focus on managing the water." Water supply for irrigation is an ongoing issue, so the couple hope to use small, contoured ditches to collect, move, and store rainwater in a reservoir for irrigation. On a large scale, water management like this would mitigate the impacts of rainfall events, reducing flash flooding downstream. Wetlands and vegetation also sequester carbon and improve water quality.

**Graham, Amy, Maeve, and Owen**
*Photo provided by Amy Ouchterlony and Graham Corbett*

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> **Amy Ouchterlony**
> Fiddle Foot Farm

**Aerial view of Fiddle Foot Farm**
*Photo provided by Amy Ouchterlony and Graham*

**Isaac in the Brick Works garden**
*Photo provided by Isaac Crosby*

## Isaac Crosby
### Evergreen Brick Works (Toronto)

Evergreen is an environmental charity in Toronto, which creates spaces to benefit the community. Brick Works is a community hub in the Don Valley that showcases sustainable urban practices, including through an urban agriculture program. Lead grower, Isaac Crosby, demonstrates and teaches Indigenous farming techniques on site.

Isaac grew up farming with his family in unceded territory south of Windsor, before moving to Toronto and apprenticing in Humber's horticulture program. Isaac is black and Anderdon Ojibwe, and his ancestors harboured runaway American slaves who became some of the earliest farming settlers in several parts of Ontario.

At Evergreen Brick Works, Isaac has brought life to a former industrial site. "If we suspect that soil is contaminated, we grow sunflowers with squash and beans," says Isaac. A variation on the traditional 'three sisters' intercropping method, the three plants are sown together on mounds. Beans climb the tall stalks of corn (or sunflowers) while providing nutrients to its 'sisters' underground, and squash cover the ground quickly to suppress weeds and protect the soil.

Another Indigenous technique that Isaac demonstrates there is clay pot irrigation. Growing up, his parents used to create their own clay pots, but any terracotta pot will work. The pot is placed into the soil, with a lid of some sort, and filled with water that will seep through the pores in the clay only when the ground around it is dry. This technique protects water from evaporation, conserving more water than other forms of irrigation.

Isaac also collects the food waste from the centre and diverts it to an on-site compost heap and a vermicomposting facility in which food waste is broken down by worms. Over time, this waste is transformed into a soil-like substance that is applied to the gardens and super-charges the soil and plants with nutrients and micro-organisms.

"Indigenous agriculture has always been adapting to the weather," says Isaac. "It's about looking deeply at things, being self-reliant, saving seeds, and giving back to the soil." For Isaac, longer winters and shorter hot summers mean starting more plants indoors and looking into new crops that might do well in our changing climate—especially native and perennial plants.

He believes there is bounty all around us. "Urban agriculture is what we need," says Isaac. "It's what we've always needed, but now we're talking about it." Greening the city with 'hyper-local' food gardens will not only draw down more carbon and absorb more water, but it reconnects people to the soil and to food. Isaac is hopeful that people can turn things around. "Look at what happened after only a month of people staying home in 2020. The sky and the water cleared," he says. "I believe we just need to get out of the way to let Mother Nature heal."

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> Evergreen Brick Works

**Brick Works garden**
*Photo provided by Isaac Crosby*


## ACTION YOU CAN TAKE

If there are common take-aways from the four featured farmers, they are the importance of soil health, access to water, and supporting our local farmers. We must support the people and practices that we'll need for tomorrow, today.

Here are some things you can do to support food and farmers in the face of a changing climate:

- **Learn and share information** about solutions for climate change in agriculture: There is a growing number of resources available online, such as the **Kiss the Ground** initiative or **Ontario's soil strategy**. Nowadays, you can follow many farmers like **Fiddle Foot Farm** on social media. So, learn more and take action!
- **Support local farmers** by eating Ontario produce when it is in season: eating locally and in-season helps to reduce our 'food miles' (the distance food has travelled), our carbon footprint, and environmental impact. Check out **Greenbelt's Farmers Markets** to find out where you can buy local produce in your community, and see **Foodland Ontario's availability guide** to learn what is in season and when.
- **Support research and incentives** for practices that help farms adapt to a changing climate, like soil health improvements, water management technology, new crop varieties, and other best management practices. You can also get involved in community science initiatives to learn more about best management practices and how you can adopt them in your own garden.
- **Cultivate your relationship with food** at home and in your community: plant your own garden or join a community garden to connect with the land and your food - even growing a few herbs in pots on your balcony will help. Apply some of the practices mentioned in this report, like improving soil health and growing a diversity of crops, in your own garden. See our **Gardening in a Changing Climate** report or watch Isaac Crosby's **"Gardening with Brother Nature"** series on YouTube to learn more.

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### ABOUT THIS SERIES:

The Greenbelt Foundation partnered with experts to understand how climate change is affecting our daily lives, and ways that we can individually and collectively respond to these challenges. For other installments in the series, visit www.greenbelt.ca/in_a_changing_climate

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