Ecological Farming in Ontario

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EFAO
ECOLOGICAL FARMERS ASSOCIATION OF ONTARIO

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Chris Krucker of Manorun Organic Farm describes the farm's five-year crop rotation at a July field day.

EFAO
ECOLOGICAL FARMERS ASSOCIATION OF ONTARIO

What We Do

Established in 1979 by farmers for farmers, the Ecological Farmers Association of Ontario (EFAO) is a membership organization that focuses on farmer-led education, research, and community building. EFAO brings farmers together so they can learn from each other and improve the health of their soils, crops, livestock, and the environment, while running profitable farm businesses.

Vision

We envision an Ontario where thriving ecological farms are the foundation of our food system, and where agriculture protects our resources, increases biodiversity, mitigates climate change, and cultivates resilient, diverse, equitable communities.

Mission

EFAO support farmers to build resilient ecological farms and grow a strong knowledge sharing community.

Ecological Farming In Ontario

Ecological Farming in Ontario is published quarterly by EFAO as a benefit of membership to help keep farmers and supporters informed and in touch with one another through articles on relevant farming topics, current farmer-led research, upcoming events, and other news of interest.

Ecological Farming in Ontario is printed on Rolland Enviro-100 paper, which contains FSC certified 100% post-consumer recycled fibres. Back issues can be found on EFAO's website (efao.ca) or are available upon request. Unless otherwise noted, articles may be reprinted or adapted if credit is given.

For information about advertising please visit efao.ca/sponsorship-ads

Deadline for Winter 2023 issue: October 15th.

Help make *Ecological Farming in Ontario* a farmer's journal! Submit articles, photos, opinions and news to the editor, Laura Northey, at editor@efao.ca. We reserve the right to edit submissions for space and/or clarity.

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A Message from the EFAO Board President

Dear EFAO members,

As many of you know, EFAO was a founding member of Farmers for Climate Solutions (FCS) when the coalition was formed more than three years ago. FCS has now grown to include 27 member organizations, representing well over 20,000 Canadian farmers and ranchers from coast to coast, and EFAO continues to play an important role in the coalition's activities.

Ali English, our Executive Director, and EFAO member Tony McQuail both sit on the FCS Board of Directors. EFAO Communications and Engagement Director Laura Northey helps coordinate FCS's advocacy efforts in Ontario. EFAO member Benda Hsueh is an FCS staff member working on the farmer training program. I have had the privilege of serving in a number of roles at FCS, and am now board president.

Together, we're making an important difference.

Farmers for Climate Solutions has from the beginning focused on farmer-led, science-based policy advocacy to reduce greenhouse gas emissions and increase resilience in Canadian agriculture. FCS was one of twenty farm organizations invited to join an advisory committee to help develop a new Sustainable Agriculture Strategy in partnership with the federal ministry of agriculture that will guide environmental efforts in the sector for the next twenty years. FCS has fought hard to ensure that the strategy includes measurable climate change mitigation goals that are ambitious and achievable. I have served as the co-chair of the climate change mitigation working group of the advisory committee, where EFAO allies such as the National Farmers Union and Nature United have helped push for a target of net-zero emissions from Canadian agriculture in 2050. This work involves negotiation and compromise with the commodity groups and industry associations who are represented on the advisory committee, but the federal officials guiding the process seem genuinely committed to effective climate action in agriculture.

To support this work on the Sustainable Agriculture Strategy, FCS is launching a net-zero task force to identify pathways to net-zero in our sector by 2050. FCS has used this task force methodology in the past to develop science-based policy proposals for the sector. The net-zero task force is made up of climate modellers, agricultural economists and scientists from across Canada who will chart a path to a resilient, low-emissions agricultural system. This research effort is overseen by a group of committed farmers to ensure that the recommendations and policy proposals make sense to those who will ultimately implement the on-farm practices we need.

There are many EFAO farmers who have contributed to FCS's work, as farmer ambassadors, as mentors in the farmer training program, and as members of FCS working groups. I encourage you to check out the FCS website if you want to get involved. Working in coalition with passionate, committed farmers from all across the country is rewarding, fulfilling, and a heck of a lot of fun.

Together, we're making an important difference.

Brent Preston, President & Board Chair

Save the Date
10th Annual EFAO Conference: Watersheds

IN PERSON | Nov. 29 & 30, 2023 | Four Points by Sheraton, London

For the ecological farming community, the last 10 years have been a turning point. Across Ontario, farmers have been channeling their efforts into protecting the fields, forests, and bodies of water that sustain us all. At the same time, much more work needs to be done to produce food in ways that protect, value and honour our most vital resource: water. That's why the theme of EFAO's 10th Annual Conference is Watersheds.

The EFAO team is already working hard to build the program for this year's conference! What do you want to learn about? Please don't hesitate to reach out and share your conference speaker and topic ideas with us, at conference@efao.ca. ■

Welcome Sophie!

EFAO is please to welcome Sophie Clark to the team as Education and Conference Coordinator! Sophie supports EFAO's educational programs, including the annual conference and other events, to meet the learning needs of EFAO members. If you've got an idea (fully formed or not) for a farm tour, webinar, workshop, or other educational event – reach out! sophie@efao.ca.

Sophie brings more than a decade of experience in farming and knowledge translation with a social justice lens to the programming at EFAO! Away from work, Sophie likes to swim, make music (as Sophia Clark), and adore her dog. ■

PHOTO HIGHLIGHTS

Growing the Grain: A Field Day at Ironwood Organics

Jul 21, 2023

1. Chris Wooding describes Iron Fife, his custom polyculture wheat.

2. Ironwood Organics field day attendees pay close attention as Chris explains the different traits and harvest techniques for his small plot grains.

3. Anthony Viera shares how, as a baker, he can give feedback to Chris on how his grain selections perform in the kitchen.

4. A bread tasting gives participants at the Ironwood field day a chance to taste the grains they had learned so much about.

CSA & Livestock Farming on an Oak Savanna

July 26, 2023

5. Chris Krucker, who established Manorun Farm with his wife Denise and now runs it with daughters Naomi and Keisha, welcomes attendees to the farm with a mulberry snack — the mulberry tree is a part of the understory of this area of the farm. Crops destined for CSA shares grow in the adjacent field.

6. A majestic black walnut forms the canopy over the aforementioned mulberry behind field day participants, as Chris describes his family's experience of adding berms, swales, and diverse species of plant life to the farm.

7. At the recommendation of Mark Shephard, the Kruckers incorporated principles of permaculture and agroforestry into the farm landscape, and are working to bring back elements of the oak savanna that was once not uncommon in Southwestern Ontario. In this photo, Chris describes how the design of the swales was based on the flow of water through the farm — almost all of which comes through the culvert beneath the adjacent road.

8. A free-range chicken browses behind poultry netting, which is lightweight and easy to move frequently.

9. Field day participants and Manorun staff gather to discuss the ins and outs of running a CSA as a family and some of the benefits and challenges of having a diversity of animal and plant life integrated into the crop rotation.

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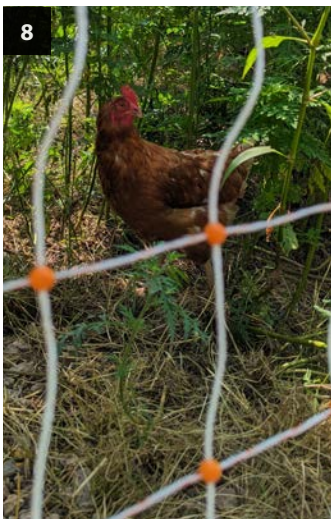

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You say Fava, I say Faba. We all say Delicious!

Results from EFAO's 2022 fava bean variety trials

By Sarah Larsen

Micheline Lalonde, grower at the rooftop farm at Avling Kitchen and Brewing in Toronto, was curious about how well fava beans grew on the rooftop farm. "Fava beans were already being featured on Avling's menu at the time [in 2021] and we wanted to see what type would have the best culinary use," says Micheline. "We had never grown fava beans on the roof, so it was an easy choice to experiment with them."

Micheline and the crew at Avling had previously participated in a Canadian Organic Vegetable Improvement (CANOVI) trial on radicchio and, through this experience, knew a variety trial would help them answer questions about the suitability of different fava bean varieties for the microclimate of rooftop gardens and specially formulated rooftop soil. To conduct the variety trial in 2022, Micheline received funding from EFAO's Farmer-Led Research Program.

Fava beans *(Vicia faba var faba; V. faba var equina; V. faba var minuta),* also commonly known as faba bean or broad bean, are a species of vetch and are among the most ancient plants in cultivation. Fava beans are a staple food of the Mediterranean region and across Eurasia, including Egypt, Israel, Turkey, Lebanon, Syria, Iraq, Iran, northern India, Pakistan, and southern China, where they form the base of dishes such as ful, falafel, and hummus. In Europe and North America, the large seeded immature beans are eaten fresh as a delicious plant protein—with or without the seed coat.

To get the trial started, Micheline and EFAO put a call out for other growers to participate, as a way to gather more information about the varieties across different farm environments. Martina Schaefer of Spiral Farm, Michelle Dang and Sharene Shafie of Toronto Metropolitan University's Urban Farm, and Leslie Moskovits of Cedar Down Farm answered the call and joined the trial.

Martina, who'd already been growing fava beans for several years for her CSA and loved both growing and eating them, wanted to trial different varieties to "diversify the genetics as 'insurance' or resilience from season to season," she says.

Michelle's motivations to join the trial were to learn about a crop she'd never grown—her experience with fava beans prior to the trial was seeing them dried or canned, or already cooked in food. She also wanted to see how this cool season crop did in the hotter microclimate of a rooftop.

Sharene was also interested in growing fava beans in a rooftop environment and comparing the results from TMU and Avling's rooftop farms. As an Egyptian, growing fava beans was also personal, since it is a culturally significant crop that she uses in many traditional dishes.

Like Martina, Leslie had been growing fava beans for years for her CSA and she always loved them. More recently, however, "we stopped growing them because we found that not many CSA members were familiar with them and often chose not to take them," she says. At the same time, Leslie's personal love of fava beans grew through a relationship with a Syrian family who Leslie helped sponsor. "We share a deep love of food, and fava beans are a very important food for them and we often eat ful together," says Leslie.

"Because of our Syrian friends, I started growing fava beans again for them. I wanted to be part of the trial to make fava beans available to more people in our community for whom they are an important cultural food."

To conduct the trial, the farmers grew six varieties of fava bean, including Tendergreen from Backyard Seed Saver; Windsor from Gaia Organics; Witkiem-Monica from William Dam; Vroma from Johnny's Selected Seeds; and two varieties from Vicia Genetics bred by Jessica Hughes in Saskatchewan, which are not yet commercially available. The farmers chose to grow two replicates of 3 to 6 of the varieties, with at least 10 plants per replicate, and collect data on general crop management, germination, early season vigour, lodging, yield, taste, flavour, texture, overall performance; and observations on crop health.

Overall, the growers found out that growing fava beans in southern Ontario—whether on rooftop farms or in-field—is tricky! "Our spring weather fluctuates wildly and fava seems not to like hot, humid weather or the temperature swings that we've been having," explains Leslie. "They also are afflicted by various insect pressures and in general are challenging to get a fulsome crop," she observed.

The other growers also noted problems with disease pressure from aphids and the clear need for consistent cool season weather.

"My main takeaway from this trial," says Michelle, "is that fava beans really are cool season crops. Once temperatures outside get above ~18°C, the beans start pushing to grow quickly which led to abnormal bean development and this really influenced yield and marketability."

Similarly, at Avling's rooftop farm, Micheline reflected that "perhaps a rooftop is not the most ideal environment for fava beans." At the same time, she was surprised to observe "considerable differences in the taste of fava varieties, some more favourable for culinary purposes than others, such as the Witkiem-Monica variety."

Experimenting with eating the fava beans that did produce was another highlight at the Urban Farm. "Fava beans can literally be eaten any which way: raw, cooked, beans with the skin on, or beans with the skin off!" exclaimed Michelle. "It's really up to your preferences for flavour, texture, and the amount of time and energy you have to prepare the beans for eating."

Michelle also enjoyed sharing the fava with her friends for which fava beans are culturally significant. "Every week," says Michelle, "my friend who is Lebanese would be so joyful and grateful for receiving the fava beans, and she would rush back home and share them with her mom who hasn't been able to find fresh fava beans in Canada since immigrating. Her mom would cook so many fava bean centered dishes, like riz by foul or fava bean hummus, and used to share it with farm staff when she could. The food was delicious!"

"Another friend who is Egyptian," Michelle continues, "told me in Egypt, they often would eat fava beans raw as a snack. His dad started popping some beans we grew into his mouth and said, 'Not as good as in Egypt, but still good.'"

Despite the tricky year growing fava beans in 2022, Sharene, Martina, and Leslie have been joined by Dillon Muldoon of the Trent Research Farm to trial them again in 2023. This year, they started the beans earlier to try to catch cooler spring conditions, and are planting three replicates each of Windsor from Gaia Organics and the two varieties from Jessica Hughes again, along with Andy's Broad Bean from BC Eco-Coop. They also plan to observe aphid predation to learn more about disease pressure in fava beans and discern any resistant varieties.

Hopeful for a better crop in 2023, Sharene says "this year I intend to make ful!" ■

Read the full research report on the EFAO's 2022 fava bean variety trial at efao.ca/fava-trial-2022.

Sarah Larsen *is EFAO's Research & Small Grains Program Director and also supports soil health components of EFAO's education programs. She holds a Ph.D. in Soil Microbial Ecology from Iowa State University, and along with her partner and their daughter, tends the land that they call Three Ridges Ecological Farm near Aylmer, Ontario.*

To make your own ful from fava beans, check out this recipe shared by Martina:
https://www.epicurious.com/recipes/food/views/spiced-fava-bean-soup-with-rice-and-tomato-51232410

Spiced Fava Bean Soup with Rice and Tomato

Ingredients

Makes 6 servings

- 2 medium onions, peeled, quartered
- 4 garlic cloves
- 1/2 cup olive oil
- Kosher salt, freshly ground pepper
- 2 teaspoons ground cumin
- 1/2 teaspoon ground coriander
- 1/4 teaspoons ground allspice
- 1 14.5-ounce can crushed tomatoes
- 8 cups low-sodium chicken or vegetable broth
- 8 ounces dried skinless fava or lima beans (about 1 1/2 cups)
- 1/4 cup short-grain brown rice
- 1/3 cup plain Greek yogurt
- 1/3 cup chopped unsalted, roasted pistachios

Step 1
Process onions and garlic in a food processor until finely chopped. Heat oil in a large saucepan over medium-high heat. Add onions and garlic, season with salt and pepper, and cook, stirring often, until softened, about 3 minutes. Add cumin, coriander, and allspice and cook, stirring often, until onions start to brown, about 5 minutes. Add tomatoes and cook, stirring often, until mixture is jammy, about 5 minutes.

Step 2
Stir in broth and bring to a boil. Add beans, reduce heat, and simmer, partially covered, 20 minutes. Add rice and simmer, partially covered, until rice and beans are soft, 30–35 minutes; season with salt and pepper.

Step 3
Top soup with yogurt and pistachios just before serving.

Step 4
DO AHEAD: *Soup can be made 5 days ahead. Let cool; cover and chill.*

Over the Hedge: Hedgelaying in Ontario

By Jim Jones

Hedgerows

I have recently been driving the back roads from Caledon where I live, to Waterloo where I am researching land-based livelihoods. As I pass through some of the best Class 1 Agricultural Lands in Canada, I'm always struck by the lack of hedgerows in this farmed landscape. I'm a relatively recent immigrant from England where we have around 500,000 km of hedgerow, so perhaps that's understandable, but considering how useful hedgerows are — from providing protection from wind and water erosion to habitats for biodiversity — it seems like something is missing. What hedgerows there are in Ontario have been in long-term decline, but there is a lack of research and discussion as to the causes and consequences of this trend. In the Ontario Landscape project and its off-shoot the Ontario Land Skills Network we have sought to foster a discussion about hedgerows in Canada by focusing on the traditional land skill of hedgelaying.

Planting hedgerows as a "living fence" for management through hedgelaying requires a high density of stems, roughly 5 plants per metre. Mount Wolfe Farm Hedge planted with the TRCA. (c)J.Jones

What is a hedgerow?

The terms fencerow and hedgerow are often confusing and loosely applied. The term hedge comes from Old English *hecg* (fence) or *haga* (enclosure). A hedgerow can describe a range of linear features, but in the United Kingdom it has the technical definition of "*any boundary line of* ***trees or shrubs*** *over 20m (67ft) long and less than 5m (16ft) wide at the base*" (Hedgelink/DEFRA).

I have heard the term hedgerow used to describe any linear strip of vegetation, including perennial herbs, but I think that's an etymological and ecological stretch! A major difference between fencerows and hedgerows is that the latter are usually managed and the former not; however, the type and timing of management for both can vary enormously! Traditional European hedgerows are managed on a rotational cycle to maintain their stock-proof utility, but their management declined with the advent of (barbed) wire fencing and the loss of labour from the land due to the agricultural intensification and the industrial revolution. Hedgerows can be coppiced to restore the vigour of growth, but this removes the fence! Instead, using the coppice response of most deciduous shrubs and trees, hedgelaying, which involves cutting the trees to ground level to stimulate growth, has emerged as a widely practiced but regionally diverse skill.

Useful Hedges

A hedgerow may take seven to ten years to establish, depending on the species composition, and with good management is not only more robust than a fence but also brings additional benefits. Chief amongst these for the arable farmer is the protection of their fields' soil from wind and water erosion. In areas where winds are strong, hedgerows can reduce erosion by as much as 50%. Hedgerows can also intercept water-borne sediment and reduce surface flow rates, capturing soil from fields above and reducing flow over fields below them.

Stakes and binders give the hedge strength while the pleached stems are healing over. Fulcrum Hedge, May 2023. (c)J.Jones

Hedgerows also make water more available to crops through the retention of moisture in leaf litter, and by facilitating the infiltration of surface water into the soil. Studies from Britain have shown that hedges can greatly increase infiltration of water into the soil, by a factor of 60 to 70 times compared to compacted upland pasture. The role of hedgerows in controlling water flows has led to their use in natural flood management.

Hedgerows enhance populations of natural enemies (predators and parasites) of crop pests by providing a wide range of habitats across the shrub layer, trees, banks, base, margins, ditches and soil. The greater the structural and floristic diversity of hedges, the greater their insect diversity and, it's assumed, insect predators. Strong evidence exists, based largely upon bees (especially bumblebees) and hoverflies, that hedgerows are also important in agricultural landscapes for the existence of healthy and diverse pollinator populations.

Agriculture contributes 10-15% of global carbon dioxide emissions, so in the future farms will need to play an important role in mitigating climate change. Hedgerows store more carbon than cropped land and so planting more hedgerows may mitigate climate change impacts.

Of course, hedgerows are essential for wildlife in agricultural landscapes too. One survey in Devon, UK showed a single hedge was home to over 2,000 species of plants and animals. Hedgerows offer nesting sites and food, but can also provide linkages between farm woodlots, scrubland and ponds for animals finding mates and new territory.

Hedgerows, and their absence, are a feature of landscape character, or what can be described as the 'feel' or sense of a place. The French term bocage is used to describe a terrain of mixed woodland and pasture connected by hedgerows. In a small study comparing attitudes to hedgerows in Canada and England, hedgerows evoked childhood memories and provided colour and diverse views to an otherwise featureless agricultural landscape.

Planting and Management

Like fencerows, hedgerows can arise naturally along fences and other linear features, and they can also be planted with intention. They can be single species but are more useful with a diversity of plants. Volunteers at Mount Wolfe Farm in Caledon, Ontario planted a hedge in 2017 which contains American hazelnut, gray dogwood, chokeberry, nannyberry, arrowwood, serviceberry, black chokeberry and fragrant sumac. To provide a dense hedge with opportunities for nesting and many stems for laying in the future, the planting followed a typical pattern of a double line, spaced 40cm (16in) apart, with plants in a staggered pattern at 30cm (12in) centres, giving five plants per metre.

Hedgerows are composed of living shrubs which will grow and will need to be managed, so there is a balance to be found between allowing shrubs to grow and keeping the hedge from becoming a line of trees, developing gaps and eventually disappearing. Hedgerows can be cut to slow their growth, but annual cutting can limit flower production and the development of fruits, berries and seeds. Annual cutting also stresses and eventually kills the plants. Evidence has shown cutting every two to three years and increasing the cut height by a few inches each time can maintain the health of the hedge.

The traditional skill of Hedgelaying

As a hedgerow grows, the shrubs will thicken and become gappy at the base, so at some point it will be necessary to rejuvenate the hedge. The practice of hedgelaying has evolved to rejuvenate a hedge while still maintaining a stock-proof structure. Hedgelaying is a catch-all term used to describe the rejuvenation of a hedge from the base by cutting and 'laying-over' of the shrub.

The Hedgelaying cut: A "pleached' black walnut. The tree is cut 4/5 of the way through, leaving a hinge of live wood. Growth will occur along the "pleacher' and also from the base. (c) J.Jones

There are many different styles of hedgelaying throughout the world, with at least 16 styles in the UK alone. In some styles, wooden stakes are positioned at intervals along the hedge and long 'binders' are woven in across the top to give the hedge strength.

After the hedge is layed, it is common practice to cut the hedge annually to establish lateral growth and create a bushy hedge. After about 5 years, cutting can be relaxed to every 3 or so years, but each cut is perhaps 5 cm higher each time so the hedge progressively grows in height from 1.2m (4ft) when layed to between 2.4- 2.6m (8-12ft). At this rate of growth, a hedge might need to be layed once a generation.

Hedgelaying In Ontario's Landscape

In 2016 the University of Waterloo and partners in southern Ontario, funded by the Social Sciences and Humanities Research Council, began working together to examine landscape planning and management practices within the Greater Golden Horseshoe, using hedgerows and hedgelaying to connect to broader themes including place-making, collective stewardship, agro-ecology and social-ecological resilience. There were four pilot plantings at Mount Wolfe Farm, Albion Hills Community Farm, a private property in Inglewood and one with the TRCA at Rouge Park. Hedgelaying demonstrations took place at Mount Wolfe Farm and the Quilley residence in Elora. Since then, approximately 5km of mixed species hedgerow has been planted, and hedgelaying workshops and demonstrations have occurred regularly. In 2019, hedgelaying enthusiasts came together in Ithaca, New York State at Steve Gabriel's Wellspring Forest Farm for a two-day workshop. In May 2023, a hedgelaying workshop took place at the Fulcrum Skillshare in Bancroft, ON.

A Small Farm Future?

It's unlikely that without major government or industry investment hedgerows will become a feature of an industrial agricultural landscape. However, that's not everyone's vision of the future for farming and food. Chris Smaje's excellent book a Small Farm Future (and its soon to be published follow-up) paints a picture of a future where local food production by small farms is the only sustainable solution. Reducing field sizes and planting hedgerows would protect bird and pollinator populations, suggests research by Lenore Fahrig, a Carleton University-based landscape ecologist. It's clear that a conversation over the hedge is an important one for the future of farming in Ontario.

There are more hedgelaying workshops planned this fall. For further information sign up to the Ontario Land Skills Network mailing list at www.ontarioruralskillsnetwork.com ■

Laying a mixed species (silver maple, black cherry, pin cherry) hedgerow at Fulcrum Skill Share, May 2023. (c)S.Dolamore

References

Wolton, R. et al (2014) Regulatory services delivered by hedges: The evidence base, LM0106 Technical Report for Defra and Natural England.

Smaje, C. (2020). *Small Farm Futures*. Chelsea Green Publishing.

Additional Resources

Hedgelink: www.hedgelink.org.uk – A good source of information on hedgerows in England and beyond.

National Hedgelaying Society: www.hedgelaying.org.uk

Ontario Rural Skills Network www.ontarioruralskillsnetwork.com

Jim Jones *is an ecologist with 15 years experience in UK Conservation where he specialised in landscape ecology and became an expert in hedgerow ecology. He moved to Canada in 2018 and is now a PhD Candidate in social and ecological sustainability at the University of Waterloo. He also teaches traditional rural skills through the Ontario Land Skills Network based at Mount Wolfe Farm in Caledon.*

Ontario's new Soil Health Assessment and Plan (SHAP) tool

By Dillon Muldoon

There's a new tool for soil health in Ontario with the release of the Soil Health Assessment and Plan (SHAP) tool by the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) this past spring. SHAP is a mobile and web based app that helps farmers and advisors identify soil health challenges through the assessment of field management practices paired with a lab analysis of current soil health indicators. The use of SHAP along with other OMAFRA soil best management practice resources provide farmers with strategies to help improve soil health.

The tool can be used in multiple ways. It can help farmers to create a soil health baseline for future monitoring, or to compare different fields or areas within a field. Because there is the option to customize modules within the SHAP tool, including management evaluations, risk, and in-field assessments, farmers have the flexibility to determine the scope and level of detail of their soil health assessments. The end result of utilizing SHAP is a soil health management plan that is tailored to the soil and production system of the farm.

How to use SHAP

The SHAP tool is divided into two parts: the soil management survey and the in-field data collection form. To start, you complete and submit a soil management survey that includes background information on your fields, soil, and management system. You can also choose to complete additional management evaluations (tillage disturbance index and living root index) and risk assessments (water erosion and compaction) modules during this step, but they are optional. The SHAP app is powered through ArcGIS (a commonly used geographic information system software) using Survey123 (a software solution for creating surveys) and is available on both personal computers or mobile devices.

Once you have completed the soil management survey and you are ready to go to the field, fill out the in-field data collection form and any other optional in-field module additions that you'd like to add (e.g. soil structure assessment), and collect your soil sample. The optimal time to collect a soil sample for SHAP is in June, or at least six weeks after the last tillage event. To collect the sample, take 15-20 cores (2cmx15cm) with a soil probe within an area of roughly 300 square feet (3 meter radius of a circle). Take cores that are 6 inches in depth and remove any surface debris from the core after sampling . Place the cores into a clean pail, and break them apart and mix gently before transferring the sample into the soil sample bag. If you don't have access to a soil probe you can use the spade method to collect your samples to the same depth. Once you have collected your sample, send it to the designated lab—currently the University of Guelph Agri-Food Lab—for analysis.

What SHAP Analyzes

The foundations of the SHAP tool are soil health indicators including soil organic matter, active carbon, soil respiration, potentially mineralizable nitrogen, and aggregate stability. Recent soil fertility values for pH, phosphorus, and potassium are also recorded as a part of the SHAP tool. Note that although soil fertility is an important part of soil health and crop production, SHAP does not include soil fertility analysis and does not replace or repeat existing tools to measure soil fertility.

Once you (or your advisor, if they submitted on your behalf) have submitted both the soil management survey and in-field data collection form, you will receive an email with a SHAP report template that contains the

information gathered throughout the soil management survey and in-field data collection form. When you receive the results of your soil health indicators from the lab, you or your advisor must use this information to finalize your report using the SHAP framework in Part 3 of the guidebook. This involves calculating scores using the SHAP Score Calculator, writing an overview summary of production practices, field observations and soil health results, and completing a soil health management plan table with details and justification to inform future management plans. The SHAP calculator will compare your results for each indicator to a database of Ontario soils and score them against soils in the same texture class (coarse, medium, fine).

Different users of SHAP will have different goals and, thus, the end report can be used in a variety of ways—as a benchmark to compare future assessments to, for monitoring trends over time, to understand the limitations and risks to your soil productivity, or to compare good and poor areas of your field or farm. With these multifaceted options, SHAP can be a valuable tool for soil health planning and assessment on your farm. Although SHAP scores can help guide your farm's soil health strategy the scores are not the be all and end all of soil health, and it is important to continue to assess both physical and chemical soil properties of soil health as a part of your farm's strategy.

You can find the Soil Health Assessment and Plan Guidebook on the Field Crop News website (a resource produced by the Ontario Ministry of Agriculture, Food, and Rural Affairs).

Please note: Currently SHAP is not intended for use with soils containing higher than 30% organic matter by weight and as our understanding of soil health and science continues to advance the SHAP tool will evolve to accommodate new knowledge and soil assessment methods.

SHAP Ground Truthing Projects

Along with EFAO's Small Grains Program, the Weston Family Soil Health Initiative funded by the Weston Family Foundation is supporting two projects working on testing SHAP in Ontario.

Soils at Guelph Ground-Truthing Project

Soils at Guelph is helping to ground-truth OMAFRA's SHAP tool, which involves using soil samples from around the province and to populate and refine scoring functions within the SHAP database based on texture by sampling more agricultural soils from across Ontario from 2023 to 2025. The current focus for sampling is underrepresented soil samples that include soils from northern Ontario and soils with lighter texture (sand, loamy sand, and sandy loam). Soils at Guelph is offering a single free sample to those who qualify, which includes the SHAP analysis, soil texture, and standard fertility package ($200 value, shipping not included). To learn more and find out if you qualify, visit the Soil Health Testing page on the Soils at Guelph website.

Weston Family Foundation

Greenbelt Foundation Soil Health Testing Program

The Greenbelt Foundation is working with the Soil Health Institute in the US to measure and evaluate the impact of different BMPs on soil health. The program aims to sample 300 to 500 farms, providing one-on-one support to farmers. Samples will be taken from grain and oilseed farmers in the Hamilton, Halton, and Peel regions in 2023 and from the Niagara, York, and Durham regions in 2024. Participation is free and involves a short call, farm visit, and short discussion survey. Participants will receive a comprehensive soil health report. More information about this program can be found on the Greenbelt Foundation's website. ■

If you are interested in learning more about your eligibility or how to get involved with these soil health sampling opportunities, please reach out to Dillon Muldoon, Research and Soil Health Program Manager at EFAO: dillon@efoa.ca.

Dillon Muldoon *is EFAO's Research & Soil Health Program Manager. He is passionate about agriculture and the food systems and has a broad range of research interests including agroecology, soil health, and community food systems.*

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Mixed-up Grains: Variety Blends, Diverse Populations & Maslins

By Jackie Clark

Wisdom From the Past

As you drive through rural Ontario, it's not uncommon to come across hundreds of acres of uninterrupted corn or soybeans. These vast oceans of monoculture field crops are a relatively modern approach, adopted to accommodate ever-growing farm machinery and demand for uniform commodity products.

However, historic and even ancient agricultural practices tend toward more diversity. Cereal species mixtures, called maslins, were widespread in Eurasia and Northern Africa and are still common today in Caucasus, the Greek Islands and the Horn of Africa, according to an October 2022 review in Agronomy for Sustainable Development by researchers McAlvay et al.

Closer to home, growing "wheat, oats and barley together is a very traditional practice that was used right up until the 1970s in Canada to produce livestock feed," says Dr. Martin Entz, a professor in the Department of Plant Science at the University of Manitoba.

For centuries, growers from many different places and cultures have blended together multiple varieties and/or species of grain to capture the benefits of broader genetic diversity within a field. The McAlvay et al review found that the lived experience of farmers demonstrated that maslins can preserve yield when faced with biotic and abiotic stresses like marginalized soils and variable precipitation — and experimental trials support that conclusion. Including multiple species allows for a greater diversity of genetic traits than varietal mixtures, and can lead to benefits including reduced pest susceptibility and improved resource use efficiency through different physiological structures reducing direct competition.

A maslin growing at Ironwood Organics.

Year over year, maslins can provide climate adaptability through "passive shifts in species composition in response to environmental pressures," reports McAlvay et al.

Jellybean Populations in Manitoba

Dr. Martin Entz has experience working different types of grain mixtures, including multi-line populations of single species that are often used in organic production in Europe.

Entz developed what he calls "jellybean populations" by taking the 6th generation of wheat from 35 farmer-breeders who had been selecting on their farm for three consecutive years. He did the same thing with 4th generation oats.

For each species, "we took a representative sample from each of those farmers and put it into one bag and we are planting it every year," he explains. The seed is available for farmers to grow themselves, which is "allowing that mixture to evolve in organic production."

With these multilines you can create a wheat or oat product that is quite uniform "even though its genetic base is quite broad," Entz adds. "The idea is that we never really have a stable population, that's by design. We want to have continual evolution."

The wheat was first grown in 2020 in Swift Current, Saskatchewan. The multi-grain yielded less than the solo variety the farmer grew on another field, however "the multi-grain had many fewer weeds so there was an advantage," Entz says.

Better weed and disease tolerance allowing for preserved yield with more ecological pest management is one of the potential benefits of growing mixed grain varieties or maslins.

The four grains that make up Iron Fife, Ironwood Organics' custom polyculture.

Diversifying crops through intercropping involves harvesting and selling or using the two or more different products separately, whereas a maslin creates one product of mixed grain. Mixed grains are typically marketed as blends for livestock feed — market development is one of the challenges of increasing the adoption of this practice, says Entz.

"I think we have to prepare ourselves for many different futures and this is one way to approach creating a little bit more of a climate resilient crop," he says.

Experimenters In Ontario

Austin Bruch is an innovator in Ontario agriculture, constantly experimenting with agronomy, crop physiology and breeding.

"I started growing grains as a break crop between vegetables for soil health and weed control. I have always been interested in polycropping as it is a risk mitigation tool and can reduce input requirements," he explains.

When Bruch had leftover rye, barley, spelt, wheat, and pea seed from another experiment, he put them together and grew the mix.

"I like the mix and would definitely do it again," he says.

Growing mixes can be a good opportunity for farmers, depending on processing capabilities and market availability, he explains. Mixes can also be used for cover crop seed or livestock feed.

Chris Wooding grows many varieties and species of heirloom and heritage grains at Ironwood Organics in Athens, Ontario. In fact, he's currently growing many varieties and species of grains in one particular field on his farm.

Inspired by grain polycultures in desert high drylands of Ethiopia and Afghanistan, Wooding is experimenting with maslins. He seeded a field with a mixture of:

- 25 kg of Iron Fife, Ironwood Organics' custom polyculture of four varieties; Preston, Hope, White Fife, Rouge de Bordeaux
- 5 kg of Hope, which is one of two Canadian varieties resistant to Ug99 (stem rust)
- 2 kg of naked barley
- 1.5 kg naked oat
- 0.5 kg of Stanley
- 0.5 kg of Red Bobs
- 0.5 kg of a landrace durum
- 5 kg bag of "stuff I have leftover from our spring trials"

"There may be as many as 70 really different varieties in there," Wooding told attendees at an EFAO field day hosted on July 21.

He describes the benefits of the mixture like 'social distancing,' preventing the spread of disease to different individual plants of the same species/variety. He hopes to capture the benefits of lower disease susceptibility and increased nutrient density.

Trying to match maturity dates specifically is less important now that the climate is so unpredictable, he says, however maturity and harvesting is still a challenge for maslins. Once grains are dry, they're "a ticking time bomb" Wooding says. At any point, grains may shatter, and provide volunteers for the next season's crop. However he believes maslins are the next logical step in the progression of capturing the benefits of diversity in grain growing.

Belowground, maslins may also benefit the soil biome, Wooding explains. Different species will have diverse mycelium structures, and therefore improve soil nutrient utilization and extend the timing and variety of root exudates building glomalin (a protein produced by mycorrhizal fungi) in the soil.

Grains for the future

"Maslins can be conceptualized as an intermediate strategy between varietal mixtures and multi-family polycultures that might be employed to balance trade-offs, while also possessing unique characteristics," concludes McAlvay et al.

"A concerted global effort to characterize and revitalize maslins has been limited, with literature heavily siloed by disciplines and languages," they explain. "However, from the available literature on farmer experiences and agronomic trials, these interspecific cereal mixtures appear to possess the potential for a variety of desirable characteristics which may be advantageous in adapting cropping systems to climate change—including heightened yield advantage, yield stability, pest and pathogen resistance, weed suppression, and drought tolerance."

Innovators like Entz, Burch and Wooding are expanding our knowledge on current applications of grain mixtures, including variety blends, multi-line populations, and especially maslins, which hold the potential to help grains thrive in unfavorable and unpredictable conditions. ■

Jackie Clark *is EFAO's Small Grains Program Manager, helping encourage farmers to realize the benefits of incorporating small grains in field crop rotations. She is also an accomplished writer and former journalist.*

Long-term Land Access: Farming Public Land

As land becomes increasingly inaccessible to those without inherited wealth, alternative models for long-term land access and ownership are gaining appeal. In this Q&A with Jonathan Bruderlein of Ottawa Farm Fresh, and Fianna & Ekow from It's Giving Farm, we learn about two takes on a model that might be of interest to many EFAO members: long term land leasing arrangements on public land.

EFAO: What's your farm business like and how do you market your products? How much land are you cultivating?

JONATHAN: Ottawa Farm Fresh is an organic vegetable farm with a large on-site Farm Store, as well as a 300+ member, multi-season CSA. We grow more than 35 crops of our own, and bring in additional fruit, vegetables, and value-added products from other local Ontario and Quebec farms. We envision building a local, organic food hub that services the local community. We believe that agriculture can heal the land and nurture the mind, body, and soul of the local community

The Farm property is 100 acres total, which includes 45 acres of field and 55 acres of mixed forest. We currently cultivate seven acres.

FIANNA & EKOW: We're a brand new farm just outside Stouffville, Ontario. The land is covered by the treaty territory of the Williams Nations and is also the traditional territory of other Anishinaabek peoples, the Wendat, and the Haudenosaunee. We began leasing a farmhouse on seven acres in February of this year. We intend to be a mixed vegetable operation, growing a variety of crops and cut flowers using ecological methods on 5 acres. Our market will be a 100 member CSA and we will also sell at farmers' markets in the GTA.

Long term visioning involves growing wholesale organic seed and distribution, and we are currently working on selecting landrace varieties of okra and sea kale. We are currently very busy spending a lot of time (and money) getting things prepared, i.e. renovating the home we now live in (a stipulation of lease), cover cropping, tarping, securing a tractor, planning irrigation infrastructure, planting trees, putting up a greenhouse. We're hoping to officially launch in Spring of 2025.

Can you describe your land access arrangement and how it came about?

JONATHAN: Ottawa Farm Fresh is situated on land leased from an organization called the National Capital Commission (NCC). The NCC owns about 19 agricultural properties throughout the Ottawa greenbelt which they offer on long term lease.

We previously farmed in the Eastern Townships of Quebec and following a 3-year sabbatical spent traveling the US and Canada by van, we decided that we wanted to get back into farming, but we also wanted easy access to city amenities. Friends from Roots & Shoots Farm in Wakefield suggested considering NCC properties, and after a year and a half of visiting several farms and analyzing the soil, land and proximity to the city we settled on this farm in Gloucester.

FIANNA & EKOW: We are on a long-term 10 year combined Residential and Agricultural Lease with Parks Canada in the Rouge National Urban Park. We came across this opportunity in spring 2022 when a Request for Proposal from

Parks Canada was circulated among our networks. With the development of Rouge National Park in 2015 came lots of new land, and abandoned homes and farms acquired from the Pickering airport lands. Rouge Park has just begun opening up these properties and leasing them to prospective farmers. We submitted our RFP last year, complete with references, farm plans, and proof of financing and insurance. It was a long and emotional process that I think Parks Canada and we learned a lot from. We are one of the first farms to have signed a combined Residential and Agricultural lease in Rouge National Park. With many more farms available and as they are looking to speed up the process, they now have an online application where you can submit an expression of interest to be matched with properties that might meet your farming needs. Or you can submit a proposal for certain posted properties.

What are the terms of your lease?

JONATHAN: We have a 25 yr lease with an exit option every 5 years. This includes the house we live in on site and a large barn. The NCC is responsible for keeping the building shells in good condition, i.e. structure, siding, foundation, roof, etc. in good repair,

while the tenant is responsible for maintaining the inside of the buildings, as well as the land. This arrangement has allowed us to refurbish a century old barn on the property and turn it into a large Farm Store, with the NCC contributing to the structural costs.

FIANNA & EKOW: There are many specific terms for our lease that are determined by location, farm plan, house size/ condition etc. The house we moved into was in very rough shape so we had to create an investment report in order to make it liveable, which is offset with a rent abatement to account for the investments we are putting into the house. We are on a residential farm lease which means we are responsible for everything in the house, except for catastrophic roof, well or septic failure. We have to maintain, repair and fix anything that is broken (HVAC, appliances, electrical, water filtration, leaks, rotting joists, etc). Since moving in we have done extensive renovations (you can see some of them on our Instagram).

The agricultural lease is concurrent with the residential lease and has a per year, per acre cost. Any fixed investments we make to the land such as barn upgrades, storage, wash stations, wells, fencing, etc. become property of the Park, and there is a proposal process to get approval for any of these changes. Lease rates are very fair and most of the park is made up of Class 1 soil.

In your view, what are the strengths and weaknesses of this model of land access?

JONATHAN: The NCC is notoriously slow to deal with, but is also much more predictable and professional than a private landlord. 25 years and renewable means that we feel settled on this property and can invest time, money and energy into making improvements and setting up our business. The cost of the lease is not excessive, and we are so close to the city!

FIANNA & EKOW: We feel that having a long term lease with the government presents a level of security that is only matched by outright owning the property you are farming. Since it's with Parks Canada, we get the benefit of limited rent increases, transparency, and stability that might be harder to come by with private landlords that can raise rent or change their mind at any given moment. It's part of the reason we feel comfortable with investing in our farm while making long term decisions, also because the incentive for Parks Canada is not to make money off of tenants, and their values of environmental sustainability and conservation align with our own.

The model we have with Parks is very new and so there are understandably things that are being worked out, making it hard to point out weaknesses. One drawback we can think of is that it can take time to get things approved. I.e. an irrigation pond might need an environmental and archeological

From Parks Canada:

Do you want to live, work, and farm or operate a commercial business in Canada's first National Urban Park? Unique property leasing opportunities are now available at Parks Canada's Rouge National Urban Park. Please visit our new 'Realty Services' webpage for general information about our leasing opportunities and process. Expressions of interest from the public are now being accepted.

For more information visit:
https://parks.canada.ca/pn-np/on/rouge/info/serviceimmobilier-realty

Parks Canada Parcs Canada

assessment. But our ecological farming practices often involve environmental work that aligns with what the park wants, so for example we can work together to plant trees for windbreaks and shelterbelts. Though initial costs are much cheaper than buying land, starting a farm or renovating a house is a costly affair, and not all properties have the infrastructure needed to start farming right away, so showing you have the financing available to execute your proposal or business can be difficult. Also, some of the properties are in "as is" condition, meaning there might not be information on important things such as well capacity, or plumbing and electrical, so you need to make your own assessments, which come with an inherent amount of risk.

Is there any other information or advice regarding land access that you'd like to share with other farmers?

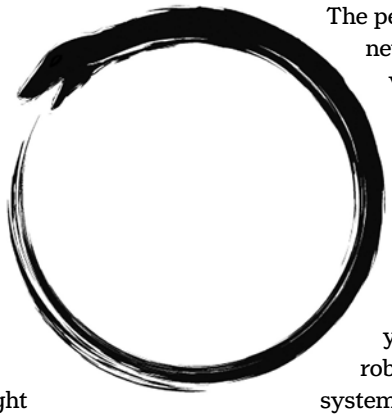
FIANNA & EKOW: It feels hard to give advice when it feels impossible to access land in Ontario, and when in reality for many it is [impossible]. Farming is hard work, long term investments in the soil are priceless, equipment is very expensive, building a network of markets and clients takes years. Taking on all of this risk without a long term arrangement would cause anyone to lose sleep. We think farmers should be able to demand this stability to lower risks with what is already a risky career and business. The biggest advice we can give is make sure that a long term lease and stability is in place, no matter what. Being kicked off land you have cultivated for years is gut wrenching. In saying that, we are constantly inspired by the unique farm arrangements friends and neighbors have made to grow their businesses. Land access isn't going to always look like the nuclear farming family of the past and it may take time for farming arrangements to catch up with that reality but lots of farmers are making it work, have great success stories and building stronger communities. ■

The Promise of Perennials

How Kernza is a Beacon for Crops of the Future

By Kyle Woolsey

The ouroboros—an ancient symbol of a snake eating its own tail. Many cultures and traditions throughout the ages have adopted this image to represent cycles of regeneration. As the snake is continuously consumed by itself, so too is it eternally renewed. What is consumed is regenerated.

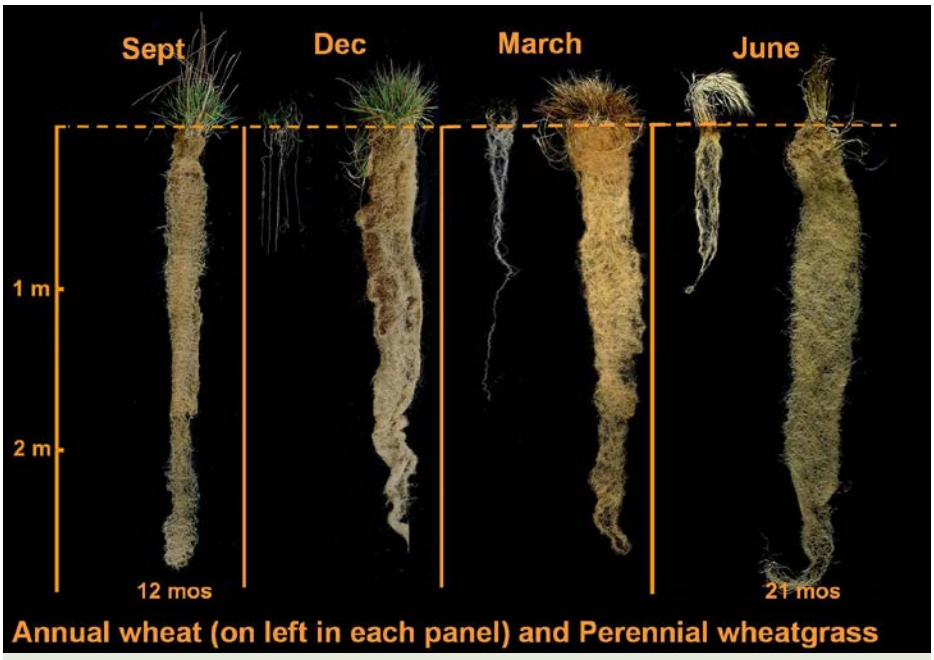


Farming systems maintained equilibrium with nature throughout most of human history, but the rise of industrial agriculture shifted this delicate balance on a global scale. Humanity now finds itself eating its own tail faster than it can regenerate. As we fight with increasing urgency to restore equilibrium, perennial crops promise to help balance the scales.

Around the world, crop production mainly relies on yearly cycles of planting, growing, and harvesting. The annual model of agriculture doesn't inherently pose a threat, but it comes with a steep environmental cost when practiced on millions of acres across the globe. The soil disturbance of industrial tillage contributes to the climate crisis by releasing huge amounts of stored carbon into the atmosphere. And as ecological farmers are all too aware, annual tillage also depletes the soil through erosion, nutrient loss, and disruption of the microbiome. And with each planting season, the herbicides that are applied to suppress or kill weeds that compete with new crop seedlings can wreak havoc on surrounding biological communities. The result of industrial annual farming is a net loss for ecosystems.

The perennial crop model isn't new. Apple trees, grape vines, and asparagus are examples of perennials that humans have enjoyed for millennia. While annual crops have shallow root systems that are torn up yearly, perennials have robust, deep-reaching root systems and don't require replanting for at least two years, often many more. Their depth and endurance reduces the need for annual field preparations, which minimizes disturbance, nurturing healthy soil, and in turn, healthy ecosystems.

Healthy soil is characterized by rich organic matter replete with thriving microorganisms. A flourishing microbiome in soil that is rich with organic matter has a high capacity to retain water and nutrients. It gives crops more resistance to both drought and flooding, and nutrient retention supports abundant ecosystems for people, plants, and animals.



Comparison of wheat roots to those of Thinopyrum intermedium in four seasons. Source: Jerry Glover and Lee R. DeHaan, Wikimedia Commons.

By minimizing soil disturbance, perennials help to maintain soil health and protect against erosion. The minimal soil disturbance keeps carbon sequestered in the ground, reducing agricultural contributions to the climate crisis. The benefits of perennials increase when combined with other ecological farming practices like diversified crop rotation and composting, which synergize to create regenerative and bountiful systems of food production.

Field of ripening intermediate wheatgrass *(Thinopyrum intermedium)* at The Land Institute's research farm in Salina, Kansas. Source: Lee R. DeHaan, Wikimedia Commons.

We know that climate-friendly farming is the key to unlocking a sustainable food future, but for most of history the perennial model has been confined to a relatively small subset of crops. With each growing season, the shadow of a giant group of annuals covers planet Earth.

Grains are the titans of the world's food supply, accounting for over 70% of global croplands and caloric consumption. Many of the grains produced across North America are annual monocrops grown in unhealthy soil with depleted microbiomes. A global transition to perennial grains could be a monumental positive shift towards sustainable farming. Developing perennial grains with the same economic viability as annual varieties would be a massive change requiring years of research, funding, and collaboration.

There's reason for optimism, though.

Non-profit organization The Land Institute is hoping to launch this perennial transition. Based in Kansas, The Land Institute envisions a future in which human agriculture is harmonious with the global ecosphere through perennialization. The future they see is one in which farming is regenerative rather than degenerative to the soil, water, and air. It's also a future in which global agriculture is equitable, stewarded by communities that nurture fair and just relationships between people and the ecosystems they inhabit.

Founded in 1976, The Land Institute's vision spans thousands of years. They consider successful agricultural systems throughout human history to develop new systems that have the potential to last for ages to come. While rooted in science, their projects also engage art and philosophy with a willingness to explore beyond current research and societal patterns. They're not afraid to seek transformational solutions that may take decades to realize.

The perennial pioneers at The Land Institute have ongoing research projects for legumes, oilseeds, rice, sorghum, and wheat to develop strains that match or exceed the quality of their annual cousins. The research is worldwide and collaborative, with experimental crops growing in Europe, Africa, and North America in partnership with multiple governments and organizations. Together, they pursue viable roadmaps to a sustainable future.

Amid The Land Institute's assortment of ventures stands the mighty Kernza. Heralded by The Land Institute as "the future of farming," Kernza is the trademarked name for the processed grains of intermediate wheatgrass, a perennial cousin to annual wheat. Unlike the shallow root systems of annual plants that are torn up each harvest, Kernza's roots run deep—more than ten feet deep. Its expansive root system sequesters carbon and nourishes the soil microbiome, supporting the goal of sustainable, regenerative farming practices.

The Kernza grain produced by intermediate wheatgrass boasts high levels of dietary fiber and antioxidants as well as a uniquely sweet and nutty flavour. Kernza has a wealth of uses as a whole grain, flour, or ingredient in breads, cereals, and malts. In 2016, Patagonia Provisions (a food-focused

division of the clothing company Patagonia) brought the world's first commercial Kernza product to market: a beer befittingly called Long Root Pale Ale. Dozens of Kernza products from diverse companies have been developed since, including pastas, snack foods, whiskeys, pita pockets, and pancake mix. Kernza recipes have even found their way onto the menus of eco-friendly restaurants and cafes.

Despite the early success, there's a lot more to be done for the Kernza revolution to take hold on a grand scale. To fulfil its promise as a perennial alternative to annual wheat, some major hurdles around economic viability need to shrink. Currently, Kernza has low crop yields, small seed size, and inferior grain quality compared to annual wheat varieties that have dominated farms for millenia. It will take many years of development to make Kernza comparable to annual grains.

Despite these challenges, Kernza is turning the heads of influential people and organizations, resulting in significant investments of money, time, and effort to its development. In September of 2020, The Land Institute launched a 5-year Kernza development project through a $10 million grant from the United States Department of Agriculture. The KernzaCAP (Coordinated Agricultural Program) project is jointly led by The Land Institute and the University of Minnesota in a multi-state endeavour engaging researchers, farmers, policy experts, climate scientists, educators, and industry leaders. Dubbed *Developing and Deploying a Perennial Grain Crop Enterprise to Improve Environmental Quality and Rural Prosperity,* the project seeks to scale Kernza research, production, awareness, and commercialization.

The KernzaCAP project has lofty goals to reach by September of 2025, but six interprofessional teams from 10 universities and 24 non-profit farm and food organizations have joined forces in the effort. Each team is devoted to one of six overarching objectives:

1. Advance germplasm & trait evaluation
2. Enhance agronomic & on-farm knowledge
3. Improve environmental quality
4. Engage education, extension, & policy
5. Develop supply chains & economic drivers
6. Intentional integration

Among the project's many activities in the first two years have been varietal field trials, educational events, product development, soil and water analyses, and policy outreach initiatives. The diverse operations display a collective buy-in from changemakers in pursuit of sustainable agriculture, healthy ecosystems, and economic opportunities for farmers and rural communities.

The KernzaCAP project is evidence of the growing belief that perennial grains promise to answer some of farming's toughest questions. Kernza breeding programs in the United States are developing new varieties and growing methods that can enable widespread adoption. The programs are regionally diversified, currently covering 3951 acres across 15 states to test varieties in different ecosystems. The Land Institute asserts that grain sizes and yields are increasing with each growing cycle, and that the Kernza revolution will be truly realized when the grain is grown on millions of acres globally.

There's a lot of reason for excitement, but The Land Institute also acknowledges the staggering amount of time and effort needed for Kernza to flourish. And while other perennial grains, legumes, and oilseeds are still in their infancy, The Land Institute steadfastly works to sprout their promise as well.

There's never been a better time to look to the ouroboros for inspiration. A regenerative system in which both people and planet prosper is attainable, and perennial crops have an essential role in this quest. Kernza's roots hold boundless potential, and the day may come when they reach around the world. For now, it's a question of nurturing Kernza's potential so that it can nurture us, and our planet, in return. ■

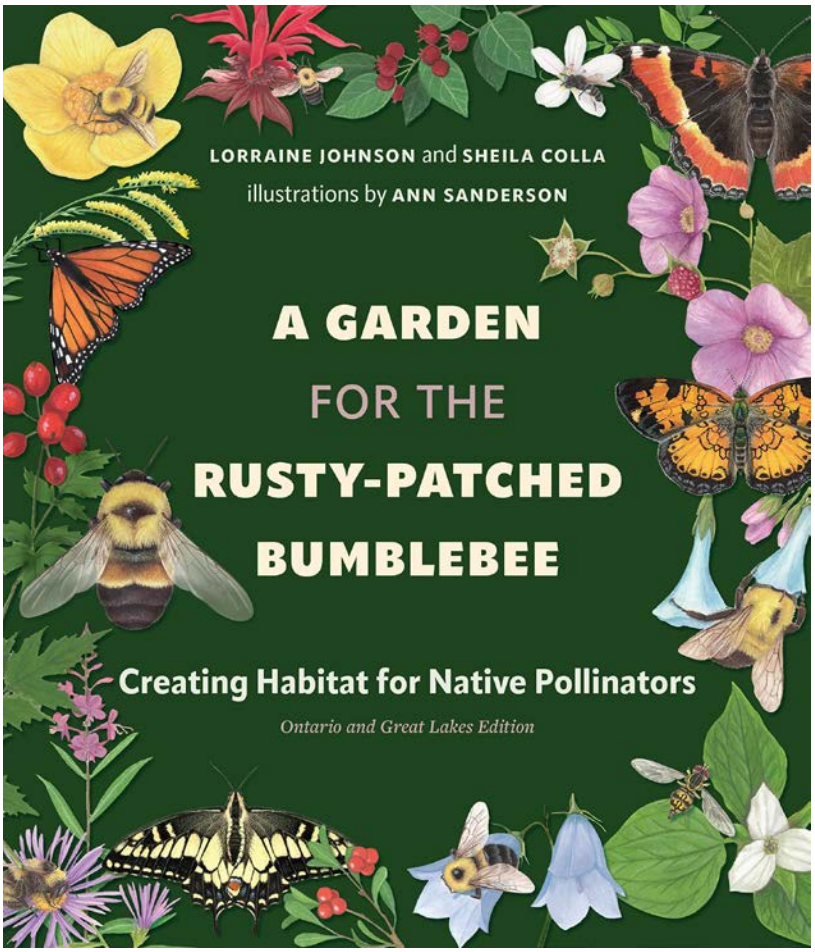
Kyle Woolsey is a writer and communications professional based in semi-rural Ontario. He's passionate about conservation, preservation, and animal welfare. Kyle divides his downtime between exercise and meditation, thinking of carrot cake during both. Reach out to him for a chat or to share pictures of your pets: kyledevinwoolsey@gmail.com.

IN REVIEW

A Garden for the Rusty-Patched Bumblebee

Creating Habitat for Native Pollinators

By Junaid Khan



I first had the opportunity to meet Dr. Sheila Colla when she allowed space for me to research European Fire Ants in her native bumblebee research lab. Along with an effortless knowledge of native bee species, their life cycles, needs, and challenges, she was an extremely welcoming presence amidst a world of intimidating scientists. Meeting Lorraine Johnson some years later after hearing her speak on the value of and need for native plants, I felt from her a similar determined, knowledgeable, and affable nature. It is no surprise then that the book they have co-authored, *A Garden for the Rusty-Patched Bumblebee: Creating Habitat for Native Pollinators,* is an incredibly easy-to-read educational joyride!

The book's namesake, the rusty-patched bumblebee, is an extirpated (locally extinct) species in southern Ontario. In fact, Dr. Sheila Colla was one of the last people to ever see one in the region in 2009. I say ONE of the last, because somewhere in my hopeful heart I wonder how many people may have seen this once common bumblebee and never noticed? The decline and disappearance of *Bombus affinis* (the Latin name for the species) in Ontario is still somewhat of a mystery, since it happened right under our noses, and seemingly quickly. The book's call-to-action is the creation of high-quality habitat that supports native pollinators, which provide immense pollination services in all landscapes, including agricultural ones. The inclusion of native plant species not only helps support native pollinators, but provides additional benefits through their immense root systems that help stabilize soil, absorb excess water, and consume atmospheric carbon.

There are hundreds of native plant species in Ontario, and the ones best for each space depends on variables like light, moisture, and soil type, as with any other crop. For most farm landscapes I have worked with, edges tend to be sunny, perhaps wet due to drainage infrastructure, and largely left to fallow. This can cause an abundance of non-native invasive species to grow here, so why not try some native ones that could establish, support pollination, and add to the menagerie! ■

Authors Lorraine Johnson and Sheila Colla

Here are 3 species I highly recommend for integration into edge habitats in your farms:

Joe Pye Weed
(sweet or spotted)
The common name refers to the spotted stems.

Sweet Joe Pye Weed
(Eutrochium purpureum)

Spotted Joe Pye Weed
(Eutrochium maculatum)

Goldenrods
(Canada, Tall, and Giant)
These three species are extremely similar in appearance, and may already be growing in your farmscape. They are incredibly hearty and support pollinators during the crucial fall season, when floral resources are reduced.

Tall Goldenrod
(Solidago altissima)

Swamp Milkweed
This species is a less successful spreader than its cousin, the Common Milkweed. The flowers are still fragrant, and attract plenty of bees, moths, butterflies, and even hummingbirds!

Swamp milkweed
(Asclepias incarnata)

Junaid Shahzad Khan, MES, *is a Muslim-Canadian from the Indus Valley, from the region that is now Pakistan. Junaid has worked as an Ecologist for over 12 years, on issues of invasive species, plastic pollution, habitat revitalization, insect conservation, and bird education. Junaid works as an independent ecologist in partnership with various community organizations to help restore Anishinaabek ecologies, culture, and language.*

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