Living Lab – Ontario is a five-year innovation project that brings together farmers, organizations, researchers, and other experts to co-develop, test, and evaluate beneficial management practices (BMPs) that address climate change challenges in livestock and cropping systems.

User-Centred Innovation | **Working in Partnership** | **Real Life Context**

NO-TILL POTATO TRIALS

PRELIMINARY SUMMARY 2025

Conducted in participation with EFAO's Farmer-Led Research Program

OBJECTIVE

The objectives of this ongoing study are to increase adoption of no-till mulching practices through co-development of research methods, support farmers to refine their practices within a collaborative network of support, and to introduce research skills to farmers.

Mulch-based no-till potato production offers meaningful climate benefits in several ways. Mulch adds organic matter to the soil, building carbon storage over time, while fewer tillage passes reduce fuel use and associated emissions. The mulch itself also strengthens resilience to a changing climate — moderating soil temperature, reducing irrigation needs, and making productive use of materials that would otherwise go to waste.

METHODS

Farmers prepared beds and planted potatoes according to their typical methods, ensuring at least one eye per piece of seed potato.They applied mulch of their choice on top of the potato seed, including one or more of the following materials:

- Woodchips
- Spent hay
- Straw
- Leaves
- Waste wool
- Deep compost

Mulch depth varied based on the material and farmers reapplied in place of hilling, as necessary, leaving 15-20 cm of the plant mulch-free. Mulch depths changed between the 2024 and 2025 trials, based on observations. See farmer-researcher observations section.

Farmers chose whether they compared no-till methods against a "business as usual" control (i.e. hilling) or tested the no-till method alone. Refer to Trial Notes and Caveats for additional details.

MEASUREMENTS

- Marketable and unmarketable yield
- General observations of health, disease, and pest pressure, etc.

FARMER-RESEARCHERS

Alberto Suarez Esteban - Nature's Apprentice Farm - EAST

Nathan Klassen - Nith Valley Organics - WEST

Glen Young & Hailey Mayfield - Cold Springs Organic - EAST

Ann Samuels - Wealths Riches Inc. - CENTRAL

Dale Hamilton - Turtle Island Acres - WEST

Markus Ticknovich - Pax Tibi Farmstead - EAST

Jonathan Segeren - WEST

Jon Gagnon - YMCA Cedar Glen + Downsview Park - CENTRAL

Amy Ellard-Gray - The Hobby Homestead - WEST

Kristine Hammel - Persephone Market Garden - WEST

Meghan Robbins - The New Farm Centre - CENTRAL

Dillon Muldoon - Trent Farm Research Centre - EAST

MAIN FINDING TO DATE

Using a benchmark of 2.4–3.0 kg/m² as a comparison to the farmer-researchers' results, a majority of the trials met or exceeded the benchmark using no-till mulching methods. Read more about how we established the benchmark under Yield Benchmark: Basis and Limitations.

TRIAL NOTES AND CAVEATS

- There was great variability in the various farm operations, including soil type, growing zone, bed preparation methods, level of mechanization, amendments applied, and irrigation practices.
- Farmers grew different potato varieties rather than a standardized variety across sites. Yield differences between sites, therefore, may partly reflect variety choice in addition to the mulching treatment. The benchmark yield kg/m² reflects the farmers total yield, not by variety. The percent marketable range table documents yields based on variety ranges. Total yield kg/m² by variety was not possible to calculate because not all farmers recorded the area by variety type.
- Plot sizes varied in treatment and total size. All yields are normalized to kg/m² to allow cross-site comparison, with the assumption that the data can be scaled accordingly.
- Dillon is the only farmer to have run replicated trials with (four replicates per treatment), making his data more robust than single-plot observations from

Potato varieties trialed in 2024-2025

Farmer	Varieties grown
2024 season	
Alberto	Yukon Gold, Bellanita, Ama Rosa, Purple Peruvian
Ann	Red Chieftain, La Ratte, Yukon Gold, Russet, Jeune
Dale	Linzer Heritage Mennonite yellow-flesh fingerlings
Hailey & Glen	Red Chieftain
Jon G	Kennebec, Chieftain
Jon S	Colomba, Violet Queen, Fingerling
Markus	Red Chieftain, La Ratte
Nathan	Chieftain, Clancy, Eva, Huckleberry Gold, Yukon Gem
2025 season	
Amy	Bridgit, Purple Majesty, Chieftain
Dillon	Red Chieftain
Jon G	Red Norland, Yukon White, Gemstar, Chieftain, Kennebec
Kristine	Sieglinde, French Fingerling, German Butterball, Purple Viking, Irish Cobbler, Huckleberry, Fianna, Kennebec
Meghan	Huckleberry Gold, La Ratte, Amarosa, Butterball

Photo 1. Amy checks her potatoes mulched in straw

> ***"7 years of no-till seems to have improved soil health, especially mycorrhizal fungi, so that the potatoes are healthier (and Colorado potato bugs are not an issue). There was practically no weeding and no irrigation needed, which are also considerations. Now I just have to figure out how to deal with voles."***
>
> - Kristine

Photo 2. Meghan's 2025 no-till and control plots at the New Farm Centre

other sites. His % marketable figures and total yield kg/m² represent averages across four replicates.

- Three farmers—Jon S, Nathan and Ann—are not included in the yield table. Plot size data sufficient to calculate kg/m² was not available, making yield normalization not possible.
- Dale and Amy's plot sizes are estimates (~) based on available information. Their kg/m² figures should be interpreted with caution.
- Jon G's plots were not formally replicated. Yield is reported as a total across all rows per treatment, normalized to kg/m², consistent with other single-site farmers in the trial.

YIELD BENCHMARK: BASIS AND LIMITATIONS

The benchmark range of 2.4–3.0 kg/m² is derived from two peer-reviewed and grey literature sources reporting total yield from small-scale organic potato production in eastern North America. Nyiraneza et al. (2021) reported total yields of 23.9–29.9 t/ha from a manure and cover crop trial in Prince Edward Island, and the Center for Integrated Agricultural Systems at the University of Wisconsin (1990, published 2021) reported an average total yield of 23.8 t/ha across three varieties in a replicated organic trial. Both figures were converted to kg/m² using the standard factor (1 kg/m² = 10 t/ha), giving a combined range of 2.38–2.99 kg/m², rounded to 2.4–3.0 kg/m². Other notes aboutthe benchmark:

- Both source studies were conducted in eastern North American climates broadly comparable to Ontario, but neither was conducted in Ontario itself or under no-till mulched production conditions.
- No yield benchmark specific to small-scale organic no-till potato production in Ontario or a directly comparable climate was identified in the published literature.
- For this benchmark, kg/m² was chosen to allow closer comparison to the scale of farmers' plots.

FARMER-RESEARCHER OBSERVATIONS

- In 2024, the farmers determined that the mulch depths chosen were likely too deep, affecting potato emergence timing and overall germination. This was especially noticeable in trials that included an initial deep mulch with no reapplication.
- Yields could vary with potato variety and mulch type. One farmer noted the difficulty locating purple/blue varieties in woodchips (vs more visible straw mulch).
- Type of mulch and application could affect other factors impacting yield such as rodent pressure. Straw and hay both were noted for low marketable potato yields due to rodent damage. However, farmers observed this was not necessarily consistent across the years or locations.
- Jon S, Jon G, Kristine all noted rodent damage in their trials.
- Mulch type could impact soil moisture levels in differing amounts. In general, farmers favoured the soil moisture retention powers of mulch with the exception of the wool and woodchips treatment trialed by Dillon where too much moisture led to rot, even in the dry 2025 season and low yields.
- Labour savings was a primary motivation for most of the farmers trialing

Photo 3. Straw mulch at Persephone Market Garden

Photo 4. Replicated mulch blocks at Trent Farm Research Centre

mulches. Farmer-researchers shared the following observations related to labour:

- Time saved could depend on the farm's level of mechanization. In particular, farms with low mechanization felt enthusiastic about labour savings on weeding, hilling and harvesting.
- Farms with mechanized operations were more split, with some favouring the mulching methods and others not seeing enough improvements to make it worthwhile.
- Impacts on marketable quality did potentially make sorting no-till potatoes more time intensive.
- Nathan noted with his trial the need for the soil to be warm enough before planting, for proper potato germination, growth and active soil biological processes to occur. He theorized that his trial did not perform as well as he hoped when he planted his potatoes early (trying to miss some pest pressures). His potato crop took longer to germinate and to grow and therefore ended up more vulnerable to potato bug predation.

> ***"The addition of both wood chip and mushroom compost mulches provided additional weed control... these mulches also increased the ease of weeding over the season. The addition of mulch might regulate soil moisture during drought (reduced watering needs). We would use mulches again in the future to grow no-till potatoes."***
>
> - Amy

WOULD YOU GROW THIS WAY AGAIN AND WHY?

Each year we asked participating farmers if they would use the no-till mulching methods again for their potatoes. In 2024 and 2025, 12 farmer-researchers answered yes and only one farm, Hailey and Glen's, answered no, not feeling it worthwhile with their set up, which equated to a marginal labour difference. This overwhelming positive response to this method was a surprise, since not all farmers achieved desirable yields. Based on their responses, however, there is a continued desire to perfect these practices and the learning curve is worthwhile to them. The following lists some of the benefits they shared:

- Ease of weeding, hilling, and harvest
- Better soil texture and biology
- No-till mulch reduced weeding and hilling labour over the hilled control
- No-till mulch improved planting and harvest ease
- The yields were fair considering the droughts experienced
- Appreciation for the simplicity of method

SOURCES

Nyiraneza, J., et al. "Improving Soil Quality and Potato Productivity with Manure and High-Residue Cover Crops in Eastern Canada." *Plants* 10.7 (2021): 1436. PMC, pmc.ncbi.nlm.nih.gov/articles/PMC8309297/.

Center for Integrated Agricultural Systems, University of Wisconsin. "Organic Potatoes: They Can Be Grown, But Can They Be Profitable?" Research Brief No. 4. University of Wisconsin, 1990, published 2021. cias.wisc.edu/crops-and-livestock/organic-potatoes-they-can-be-grown-but-can-they-be-profitable/.

EFAO REFERENCE TRIALS

No-till potatoes with mulch - 2022-2023 - Matt Jones, Karlo Bobinac, Andre Houle, Rick Cornelissen, Eleanor McGrath, Rob McKay, Patti Charbonneau

Variety trial growing no-till potatoes with mulch - 2023 - Rob Read

Percent marketable yield by variety in 2024-2025

Variety	% marketable yield	Farmers (mulch)
Amarosa	94–97%	Alberto (Leaves); Alberto (Straw); Meghan (Straw)
Bellanita	95–98%	Alberto (Leaves); Alberto (Straw)
Bridgit	92%	Amy (Straw)
Butterball	74%	Meghan (Straw)
Chieftain	46–93%	Jon G (Leaves); Jon G (Straw); Jon G (Woodchips); Nathan (Woodchips); Amy (Straw); Jon G (Leaves/woodchips)
Clancy	88%	Nathan (Woodchips)
Colomba	25%	Jon S (Wheat straw)
Eva	88%	Nathan (Woodchips)
Fianna	50%	Kristine (Old hay/switchgrass)
Fingerling	53%	Jon S (Wheat straw)
French Fingerling	58%	Kristine (Old hay/switchgrass)
Gemstar	44–95%	Jon G (Leaves); Jon G (Leaves/woodchips); Jon G (Woodchips)
German Butter Ball	66%	Kristine (Old hay/switchgrass)
Huckleberry	83%	Kristine (Old hay/switchgrass)
Huckleberry Gold	94%	Nathan (Woodchips); Meghan (Straw)
Irish Cobbler	22%	Kristine (Old hay/switchgrass)
Kennebec	21–89%	Jon G (Leaves); Jon G (Straw); Jon G (Woodchips); Jon G (Leaves/woodchips); Kristine (Old hay/switchgrass)
La Ratte	28–76%	Ann (Compost/leaves/mulch); Markus (Woodchip mix); Meghan (Straw)
Linzer Heritage Mennonite yellow-flesh fingerlings	77%	Dale (Spent hay)
Purple Majesty	61%	Amy (Straw)
Purple Peruvian	95%	Alberto (Leaves); Alberto (Straw)
Purple Viking	35%	Kristine (Old hay/switchgrass)
Red Chieftain	42–85%	Ann (Compost/leaves/mulch); Hailey & Glen (Spent hay); Markus (Woodchip mix); Dillon (Woodchips); Dillon (DCM); Dillon (Wool and woodchips)
Red Norland	97–98%	Jon G (Leaves); Jon G (Leaves/woodchips); Jon G (Woodchips)
Sieglinde	88%	Kristine (Old hay/switchgrass)
Yukon Gem	94%	Nathan (Woodchips)
Yukon Gold	99%	Alberto (Leaves); Alberto (Straw)
Yukon White	92–98%	Jon G (Leaves); Jon G (Leaves/woodchips); Jon G (Woodchips)

Note: Violet Queen (wheat straw, Jon S 2024) produced no marketable yield and is excluded from this table. As it was grown at one site only, no conclusions can be drawn about variety performance.

Yield summary for control plots in 2024-2025

Varieties grown without mulch treatment, shown separately for comparison.

Variety	% marketable yield	Farmers
Amarosa	99%	Meghan
Butterball	99%	Meghan
Chieftain	92%	Nathan
Clancy	88%	Nathan
Eva	82%	Nathan
Huckleberry Gold	96–98%	Nathan; Meghan
La Ratte	94%	Meghan
Red Chieftain	85–88%	Hailey & Glen; Dillon
Yukon Gem	91%	Nathan

Plot size and yield summary for 2024-2025 no-till potato trials

Data is sorted by mulch category. All weights in kg. A benchmark of 2.4 - 3.0 kg/m² was used, as described in the text.

Mulch material	Year	Depth (cm)	Reapplied	Plot size (m²)	% marketable	Yield (kg/m²)	Control (kg/m²)	Meets benchmark	Farmer
Straw / Hay									
Old hay and switchgrass straw	2025	15–20	✓	162.58	62%	**1.26**	—	✗	Kristine
Spent hay	2024	45	✗	22.86	63%	**3.67**	**6.12**	✓	Hailey & Glen
Spent hay	2024	12	✗	~25.12	67%	**~2.13**	—	✗	Dale
Straw	2024	15	✓	14.63	47%	**4.67**	—	✓	Jon G
Straw	2024	20–25	✓	~22.30	96%	**~6.64**	—	✓	Alberto
Straw	2025	60	✓	13.01	60%	**3.55**	—	✓	Amy
Straw	2025	15–18	✓	33.44	70%	**5.30**	**3.68**	✓	Meghan
Woodchips									
Woodchip mix	2024	12–15	✗	22.30	70%	**2.80**	—	✓	Markus
Woodchips	2024	15	✓	15.10	83%	**3.99**	—	✓	Jon G
Woodchips	2025	15	✗	40.88	85%	**1.96**	**1.60**	✗	Dillon
Woodchips	2025	15–20	✓	29.03	88%	**3.82**	—	✓	Jon G
Leaves									
Leaves	2024	15	✓	8.13	50%	**6.03**	—	✓	Jon G
Leaves	2024	20–25	✓	~22.30	97%	**~7.52**	—	✓	Alberto
Leaves	2025	20–30	✓	19.51	62%	**2.82**	—	✓	Jon G
Mixed / Combo									
Woodchips and leaves	2025	20–30	✓	14.64	83%	**4.31**	—	✓	Jon G
Wool and woodchips	2025	15	✗	40.88	42%	**1.43**	**1.60**	✗	Dillon
Deep compost									
Deep compost (DCM)	2025	15	✗	40.88	81%	**1.89**	**1.60**	✗	Dillon

Plot size and yield summary for 2024-2025 control plots

Description	Year	Marketable (kg)	Total (kg)	% marketable	Yield (kg/m²)	Meets benchmark	Farmer
Control for spent hay	2024	115.35	139.84	**83%**	**6.12**	✓	Hailey & Glen
Control (multiple)	2025	55.67	65.21	**85%**	**1.60**	✗	Dillon
Control for straw	2025	167.70	172.50	**97%**	**3.68**	✓	Meghan

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