

No-till organic potatoes with a rye cover crop



FARMER-RESEARCHER
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IN A NUTSHELL

Continuing previous work on an organic system for no-till potatoes, Ken tested the performance of the varieties in this system and the effect of planting depth on marketable weight.

- Gemstar Russet and SP327 produced similar yield and marketable weight under tilled and no-till management
- Norland had lower yields under no-till management
- Ken found no significant difference in yield or marketable weight between 3" and 5" depths under no-till management

MOTIVATION

For organic growers, finding systems that keep the soil covered and minimize tillage is an important step to reduce costs associated with tillage passes, reduce soil loss to erosion, and promote soil health with less disturbance.

To address this challenge for potatoes, a high-tillage crop, Ken developed a cover cropping system as part of his work with the Living Lab-Ontario project. Specifically, the system uses a rye cover crop to grow potatoes without hilling or weeding throughout the growing season.

A big concern with growing systems for potatoes that don't use hilling is greening. While he didn't observe major greening issues in his previous trials, Ken was curious to optimize the system by investigating how different varieties—with their different tuber depths—performed in the no-till system, and to explore the effect of planting depth.



Planting potatoes into standing rye.

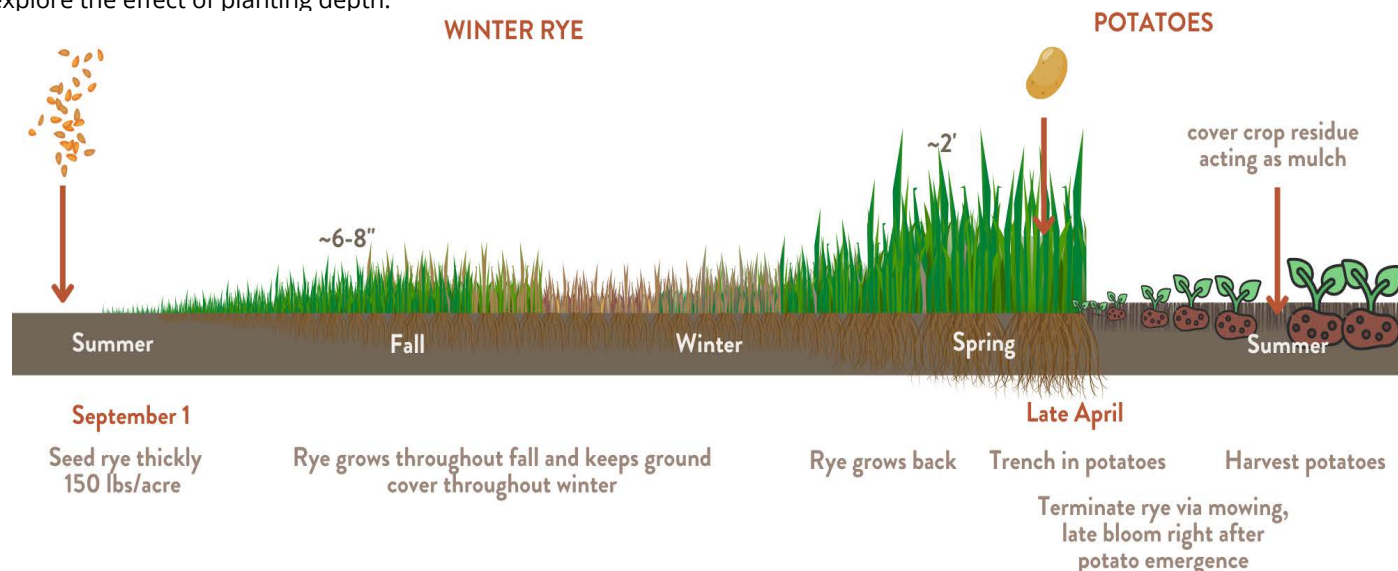


Figure 4. For the reduced tillage potato system, Ken seeded a winter rye cover crop at 120 lbs/ac on September 1st the year before potatoes. Ken planted the potatoes into the standing cover crop in late April or early May and terminated the rye via flail mowing at first potato emergence. Ken notes that mowing gets better termination than rolling. Ken did not hill or weed the potatoes throughout the season. In 2021 Ken planted Orchard Hill Rose, a leafhopper resistant potato that he and his family selected in cooperation with The Bauta Family Initiative on Canadian Seed Security, into a cover crop of winter rye and hairy vetch. He side dressed the plots with 1200 lbs/ac organic hen pellets, and applied the organic pesticide Entrust for Colorado potato beetles once. Read the full report at efao.ca/research-library.

Figure 2. Layout of Ken’s trial for the three potato varieties. NT = no-till management; C = control (tilled management).

VARIETY	PAIR 1		PAIR 2		PAIR 3		PAIR 4	
Norland	NT	C	NT	C	C	NT	NT	C
Gemstar Russet	C	NT	C	NT	NT	C	C	NT
SP327	NT	C	C	NT	C	NT	C	NT

METHODS

VARIETIES

Ken compared Norland, Gemstar Russet, and SP327. For each variety, he compared four pairs and randomly assigned each pair to no-till or control (tilled, hilled) management.

PLANTING DEPTH

To compare 3” and 5” planting depth, Ken planted four pairs of rows of Orchard Hill Rose and randomly assigned planting depth to plots in each pair.

DATA ANALYSIS

To evaluate the effect of management (no-till/tilled) on each potato variety, we used a statistical model called analysis of variance (ANOVA) with a 95% confidence level to calculate the least significant difference (LSD) needed to call the treatments “statistically different”. Similarly, to evaluate the effect of planting depth, we used a paired t-test with a 95% confidence level.

Using a 95% confidence level means that if we measure a difference between any two treatments that is greater than the calculated LSD, we expect this difference would occur 95 times out of 100 under the same conditions. In this case, we consider the difference reliable and refer to the results as statistically significant. On the other hand, if we had measured a difference between any two treatments that was less than the calculated LSD, we would consider these treatments unreliably different or statistically similar. We could make these statistical calculations because Ken’s experimental design involved replication of the treatments.

FINDINGS

VARIETIES

- Potatoes in no-till plots emerged three weeks later than the tilled plots, presumably due to cooler soil temperatures. This delay was reflected in their maturity throughout the rest of the season but did not affect final yield measurements.
- Gemstar Russet and SP327 produced similar yield and marketable weight under tilled and no-till conditions.
- Norland had lower yields under no-till.



One of four replicates showing six rows of tilled control on the left and six rows of the no-till treatment on the right. The advanced maturity and size of plants in the control reflect the three week delay in the emergence of the no till treatment rows.

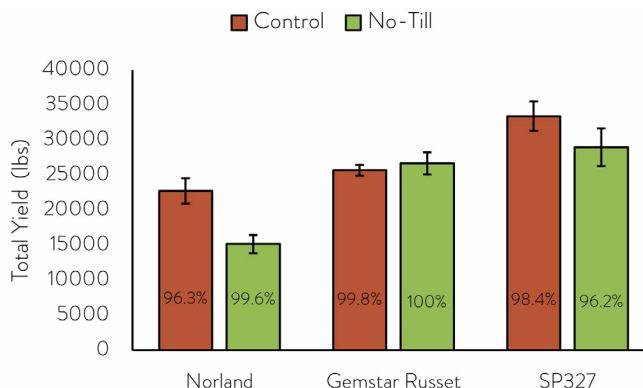


Figure 2. Total yield of the three varieties using no-till and control methods. The number in the bars is % marketable due to greening.

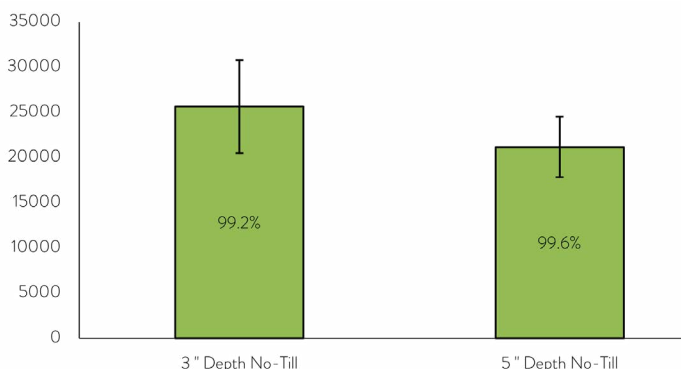


Figure 3. Total yield of Orchard Hill Rose planted at depths of 3” and 5”. The number in the bars is % marketable due to greening.

PLANTING DEPTH

For planting depth, Ken found no significant difference in yield or marketable weight between 3" and 5" depths (data not shown).

NEXT STEPS

The cumulative data on this system indicate that it is possible to greatly reduce the tillage involved in potato production in the growing season. Next steps for this system would be to demonstrate organic no-till potatoes using a rye cover crop would be to trial it on a larger scale.



One pair of rows in the planting depth trial.

TAKE HOME MESSAGE

- Potato varieties appear to vary in their suitability to no-till production.
- For some potato varieties, using a rye cover crop and planting no-till can produce similar yields to tilled organic production with little change in the amount of greening.
- Deeper planting did not have an impact on greening and may reduce yields.