

No-till Cropping of Cabbage to Improve Soil Health

RESEARCH SUMMARY | ON-FARM DEMONSTRATION RESEARCH & MONITORING | 2024

RESEARCH LOCATION

- Pemberton, BC

FARMER COLLABORATORS

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AUTHORS

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HIGHLIGHTS

- This project evaluated the effect of adopting no-till practices on cabbage yield and soil health, with a goal of increasing soil carbon.
- No-till practices provided comparable cabbage yield to standard tilling practices.
- This trial indicated that no-till practices may have a positive effect on soil organic matter after only one year. Long term effect of no-till on soil organic matter should be evaluated.
- Labour time required to produce cabbage using no-till practices appears to be similar to standard tilling with additional time required to plant but less for weeding.

MOTIVATION

- Non-soil-disturbance growing approaches (no-till) have many potential benefits, including the improvement of soil structure and biology leading to increased soil organic matter and balanced nutrient release.
- A challenging aspect of no-till is the termination of the previous crop, with different approaches being used and trialed.
- On-farm demonstration research is a way to evaluate which approach will work best for individual farmers.

RESEARCH OBJECTIVE

The objective of this on-farm demonstration research was to evaluate the effect of adopting no-till practices on cabbage yield and soil health, with an overarching goal of increasing carbon in the soil. The research questions this trial addressed were:

1. Do no-till practices increase soil organic matter?
2. Do no-till practices provide comparable yield to conventional tillage in a cabbage crop?

METHODS

BED PREPARATION

Two 150 feet long cabbage beds were established on June 3, 2023. One was a tilled bed (Till) and the other a no-till bed (No-Till). Both beds were established in a previously grown fall-rye/crimson clover cover crop (Fig. 1a).

The steps were:

1. The cover crop was flail mowed in both beds in the spring.
2. Each bed initially received one bucket load of compost.
3. One layer of a 48-inch wide paper was laid over the no-till bed (Fig. 1b).
4. One additional bucket load of compost was applied to each bed.
5. The till bed was cultivated prior to planting (Fig. 1c).
6. Both beds were irrigated prior to planting (to wet the paper).
7. Two rows of cabbage transplants were planted in both beds.
8. All fertilizer and amendment inputs were the same in both beds.

WHAT IS ON-FARM DEMONSTRATION RESEARCH?

- Demonstration research is small-scale testing of an innovative practice on a working farm.
- Guided by producers' goals, demonstration research provides the farming community with experience and information about a new practice, product or technology.
- This research summary is intended to share information and is not official guidance.

SOIL TESTING

- Soil was sampled twice; end of April (spring) and early October (fall). Spring sampling consisted of one composite sample of 15 cores in each bed. In the fall, two composite samples of 15 cores in each bed were taken (one in the north half and one in the south half of the bed) to capture potential soil variabilities within beds.
- Soil was sampled to 30 cm with the 0-15 cm and the 15-30 cm layers submitted separately to the Terralink Plant Science Lab in Abbotsford, BC, for a complete soil analysis.

YIELD ASSESSMENT

- On September 20, yield was assessed by randomly selecting three consecutive cabbages and weighing each head, repeating this process four times in each bed (total 12 heads per bed).
- On October 11, the grower harvested 98 heads in each bed and recorded total weight.

RESULTS

SOIL TESTING

- Prior to bed establishment, soil organic matter (SOM) was higher in the 0-15 cm layer than in the 15-30 cm layer, and no notable differences were observed between beds (Table 1).
- SOM increased in both beds by fall, likely due to the added compost.
- In the fall, there was a difference in SOM between beds, with the no-till bed having higher SOM in the top layer of soil (0-15 cm), and marginally higher SOM in the 15-30 cm layer.



Figure 1. a) Established fall rye/crimson clover cover crop, b) layer of paper in no-till bed, c) the no-till bed (left) and the control bed (right) ready for planting.

YIELD ASSESSMENT

- Yield was similar in the tilled bed compared to the no-till bed during both yield assessments, but there was slightly more variability of sizes in the tilled bed (Table 2).
- Yields were higher overall at the second assessment as the crop had an additional three weeks to grow.

ADDITIONAL OBSERVATIONS

- The no-till bed required 50% more planting time compared to the tilled bed. A shovel was needed to create planting holes in the no-till bed (to pierce through the paper and the undisturbed soil) (Fig. 2).
- Weeding took 40% more time in the tilled bed due to enhanced weed pressure compared to the no-till bed.
- It took longer for the soil to reach optimal moisture during irrigation in the no-till bed, but soil moisture was maintained for longer. This indicates a potential for longer, but less frequent irrigation in no-till crops. In this trial, both treatments received the same irrigation regime for consistency.
- Visual observation of growth indicated equal performance between beds (Fig. 3ab)
- Soil appeared to be slightly more compacted in the no-till bed when conducting fall soil sampling.



Figure 2. The use of a shovel was required to create planting holes in the no-till bed.

Table 1. Summary of soil organic matter content (%) in the tilled bed (Till) and no-till bed (No-Till) prior to bed establishment (spring) and after the growing season but prior to cultivation (fall) in two soil layers (0-15 cm and 15-30 cm). Fall results are based on averages of two samples.

	SOM Spring		SOM Fall	
	0-15 cm	15-30 cm	0-15 cm	15-30 cm
Till	6.4	1.3	7.9	3.3
No-Till	6.1	1.9	9.6	3.6

Table 2. Summary of average yield per head (lbs/head) for two harvest events, one conducted September 20 (12 heads per bed) and one done October 11 (98 heads per bed). The Range (min-max) is provided for the 1st harvest.

	1 st Harvest (lbs/head)	2 nd Harvest (lbs/head)
Till	7.0 (4 - 11.26)	7.8
No-Till	7.1 (3.64 - 9.01)	7.7



Figure 3. Side by side view of the no-till bed (left) and tilled bed (right) on a) August 10 and b) September 20.

CONCLUSIONS & NEXT STEPS

- This trial indicated that no-till practices may have a positive effect on soil organic matter after only one year. Long term effect of no-till on soil organic matter should be evaluated.
- No-till practices provided comparable cabbage yield to standard tilling practices, with a trend towards more crop uniformity in no-till.
- Labour time required to produce cabbage using no-till practices appears to be similar to standard tilling with additional time required to plant but less for weeding. In addition, there appears to be a potential for longer but less frequent irrigation for no-till production.
- This was an observation trial (side by side) with no replication of treatments. Data collection over multiple years is recommended to gain confidence in the results.
- This trial will be re-evaluated over the next few years using the same location with lettuce (2024) and squash (2025) as the target crops.

FIND MORE INFORMATION:

Read the research manual:

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/programs/regional-extension/no-till_cropping_of_cabbage_to_improve_soil_health.pdf



Find more demonstration research:

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