



No-till improves yield and soil organic carbon in western Canada

CATEGORY [soils and fertility](#) | February 1, 2024

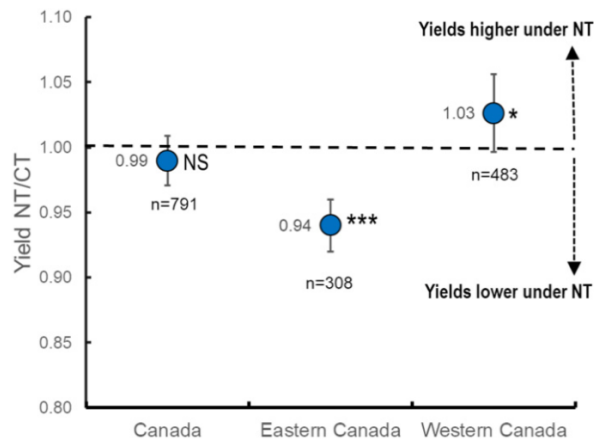
In western Canada, no-till improved wheat yield by 7%, canola by 10%, and legumes like beans, peas and lentils by 9% compared to conventional tillage. These higher yields provide higher carbon inputs into the soil to help increase soil organic carbon and reduce greenhouse gas emissions. In contrast, yields were lower with no-till in eastern Canada.

The adoption of no-till farming practices began in western Canada in the late 1980s and early 1990s. Since then, no-till has become the dominant form of seeding in western Canada. The adoption in eastern Canada has lagged that of western Canada. Researchers conducted meta-analysis studies of crop yields under no-till and conventional-till in Canada, and how they affect soil organic carbon change in the soil.

One meta-analysis built on a Canadian dataset by Pittelkow et al. (2015) and added 6 more studies published after 2015. This resulted in a total of 83 studies with 808 side-by-side yield comparisons of NT and CT. Most studies were over 3 years in length, and more studies were available in western Canada than eastern Canada.

Canada-wide, there was no significant difference in yield between NT and CT, but there were differences between regions. In western Canada, yields were higher under NT, but yields were lower in eastern Canada under NT.

Meta-analysis of the effects of tillage management on yield (Yield NT/CT: ratio of yield under no-till/conventional tillage) for Canada and eastern and western Canada.



NS, *, **, and *** indicate $p > 0.05$, $p \leq 0.05$, $p \leq 0.005$, and $p \leq 0.001$, respectively
Source: VandenBygaart and Liang. 2023

Overall, yields in western Canada were 3% higher yielding under NT compared to CT, while in eastern Canada, yields were an average 6% lower under NT compared to CT.

Crop type also impacted yield results. Under NT in western Canada, wheat yielded 7% higher, canola 10% higher, and legumes like beans, peas and lentils 9% higher than CT, but barley yielded 4% lower. The researchers were not sure why barley yielded lower, but based on other studies, thought it may have been due to a nitrogen deficiency under NT.

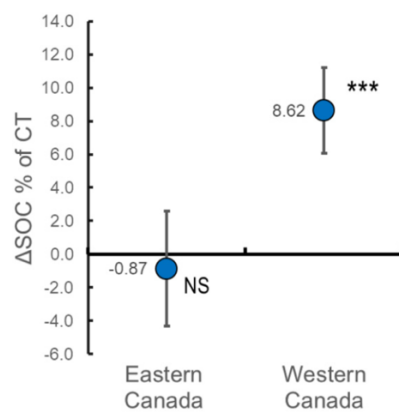
There were no significant differences in yield between crop types under NT in eastern Canada.

In eastern Canada, soils with clay textures yielded 10% lower under NT compared to CT. On non-clay soils in eastern Canada, yield was similar between NT and CT. In western Canada, there were no yield differences due to soil texture for NT and CT.

Implications for soil carbon

With yields in western Canada 7 to 10% higher for wheat, canola and legumes, these higher yields could result in higher carbon inputs into the soil in the form of above and below ground residue under NT. A recent meta-analysis by Liang et al. (2020) found that soil organic carbon averaged 8% higher under NT compared to CT in western Canada, but no significant differences in soil organic carbon change was found in eastern Canada.

Results of meta-analysis of long-term studies comparing no-tillage (NT) versus conventional tillage (CT) in eastern and western Canada derived from Liang et al. (2020).



*** $p \leq 0.001$
Liang et al. 2020

The researchers report that incorporating the effect of tillage on yield and carbon inputs will lead to improvements in the accuracy of the effects of tillage management on soil organic carbon change in Canadian cropland. This will help to improve modelling of SOC change in Canada's national inventory reporting of GHG emissions from agriculture.

Funding for this work was provided through internal support of AJV by Agriculture and Agri-Food Canada.

A.J. VandenBygaart and B.C. Liang. Crop yields under no-till in Canada: implications for soil organic carbon change. *Canadian Journal of Soil Science*. e-First <https://doi.org/10.1139/cjss-2023-0061>