

# **Influence of Tillage and Crop Residue Management on Seed Yield, Soil Quality and Greenhouse Gas Emissions**

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## **ABSTRACT**

The objective of this study was to determine the influence of tillage and crop residue management on crop yield, soil aggregation and nitrous oxide (N<sub>2</sub>O) emissions on a Gray Luvisol (Boralf) soil near Star City, Saskatchewan, Canada. The field experiment was established in 1998 on a 4-year rotation (barley-pea-wheat-canola) under two tillage systems (no tillage, NT and conventional tillage, CT), two levels of straw (straw retained, S and straw removed, NS) and four rates of N fertilizer (0, 40, 80 and 120 kg N ha<sup>-1</sup>, except no N to pea phase of the rotation). Tillage and straw treatments usually had no effect on crop seed yield in 1998, 1999 and 2000. However, in 2001 (after 4 years) NT had 389 kg ha<sup>-1</sup> more seed yield of canola than CT, and retaining straw increased seed yield by 258 kg ha<sup>-1</sup> compared to straw removal treatment, respectively. The combination of NT and straw retention gave the highest canola yield. The proportion of aggregates in the fraction with the smallest sieve opening (<0.42 mm) was significantly greater in CT compared to NT, while there was a higher proportion of large aggregates (>12.7 mm) under NT than under CT. Addition of straw tended to increase the proportion of large aggregates and decrease the proportion of fine aggregates. The NT with straw retention gave the lowest proportion of fine aggregates (<0.42 mm) and greatest proportion of large aggregates (>38 mm). This suggests less potential for soil erosion when tillage is eliminated and crop residues are returned to the soil. The N<sub>2</sub>O emissions were higher in N-fertilized treatments than the zero-N treatments, and were substantially higher in CT plots than in NT plots where N was applied. In summary, the findings suggest that returning crop residue under NT would improve soil quality and productivity and may also be better for the environment.