

AGR1501: Effects of Vertical Tillage on Soil Structure and Crop Yields in Southern Saskatchewan

The accumulation of crop residue at the soil surface can interfere with field operations like seeding, negatively affecting germination and emergence and hence crop yield. Vertical tillage and tandem disc implements are used to manage residue and alter soil physical conditions, mainly at the soil surface. Also, raking and burning is used as an alternative for management of difficult crop residues such as flax straw. The objective of this study was to evaluate and compare the effect of surface vertical tillage, conventional tillage utilizing a tandem disc, raking and burning, and no-till direct seeding into flax stubble on soil physical properties and crop yield in a Chernozemic soil in southern Saskatchewan, Canada over a three year period. The research study site was located near Central Butte, SK. Vertical and tandem disc tillage did not significantly affect aggregate size, while aggregate stability was slightly reduced by tandem discing. There was also a trend for burning to decrease aggregate stability. In the following season, no-till tended to have higher surface soil moisture content than the tillage treatments. The vertical tillage operation produced a smooth, level soil surface following the operation. In the following spring, the vertical tillage tended to slightly decrease air permeability and water infiltration rate compared to un-tilled soil, which may be explained by an increase in the number of fine pores. Tandem discing produced lower surface soil density. Effects of the tillage treatments on physical properties of the soil were diminished in the second year and had mainly disappeared in the third year following the treatments. There were no crop stubble burning effects on water infiltration or air permeability in any of the three years. Higher plant nutrient contents were observed in crops grown on the burning treatment, likely reflecting some concentration of nutrient in the ash. Following imposition of the treatments in the fall of 2015, crop yields of wheat (*Triticum aestivum*) (2016), peas (*Pisum sativum*) (2017), and canola (*Brassica napus*) (2018) grown in subsequent years were similar and were not significantly different, but mean yields were slightly higher on the vertical tillage treatment over the three years. Direct seeding into the flax residue was successful because the flax crop was harvested when conditions were dry, and the residue was evenly distributed by the straw chopper on the combine. Tillage or raking and burning to reduce flax straw residue interference therefore was not needed to maximize yield under the conditions of this study. There were also no problems with equipment plugging identified in the field that would be considered an inconvenience or delay operations.