

Objective:

The objective of this demonstration was to determine if using vertical tillage in fall or spring preceding seeding can increase seedling emergence and grain yield of corn, soybean, wheat or canola compared to no tillage in northwest Saskatchewan

Methodology:

This demonstration was conducted at the AAFC Scott Research Farm in 2014 and 2015. A randomized complete block design arranged as a split-plot with four replicates. The main factors consisted of tillage treatments and sub-plots consisted of crop type (Table 1). Two replicates of each main plot were blocked together (pseudo-replicated) to minimize land required to carry out the demonstration. Vertical tillage was applied using a Salford on October 18th, 2013 and October 23rd, 2014 and May 13th, 2014 and May 8th, 2015 prior to seeding (Figure 1). In 2014, seeding occurred on May 22nd (wheat, canola, corn) and 23 (soybeans) and in 2015 on May 13th (wheat, corn, canola) and May 19th (soybeans). Tillage was applied perpendicular to stubble and crops were seeded parallel to stubble. Soil moisture was very dry in fall of 2013 when tillage was applied and ideal when tillage was applied in the spring (2014). The fall of 2014 received average precipitation allowing for soil penetration, but spring emergence in 2015 was limited due to lack of moisture. Fertilizer and inoculant was applied at seeding according to soil test recommendations for each crop. Weeds were controlled using a pre-seed burndown and registered in-crop herbicides

Table 1: Demonstration treatment list for 2014 and 2015 growing seasons

Treatment	Tillage Regime	Crop
1	Fall Vertical Tillage	Canola
2	Fall Vertical Tillage	Wheat
3	Fall Vertical Tillage	Corn
4	Fall Vertical Tillage	Soybeans
5	Spring Vertical Tillage	Canola
6	Spring Vertical Tillage	Wheat
7	Spring Vertical Tillage	Corn
8	Spring Vertical Tillage	Soybeans
9	No-Tillage	Canola
10	No-Tillage	Wheat
11	No-Tillage	Corn
12	No-Tillage	Soybeans

Key Findings:

- Tillage did not have a significant effect on corn, wheat, canola and soybeans grain yield. There are several possible explanations why tillage treatments did not affect grain yield in this demonstration.
- The vertical tillage implement used is a relatively light-duty model, with coulters running on a 90° angle, thus minimizing residue incorporation.
- The barley and wheat stubble which the demonstration was located on was not excessive; therefore, the residue management was negligible. In a situation where there would be more crop residue, such as after a corn crop, vertical tillage may have demonstrated more benefits in terms of plant emergence and grain yield.
- Results of the non-significant effects of tillage on crop yield agrees with that of Adey (2015) of Kansas State University who found no significant effect of tillage systems on corn and soybean yield in 2012, 2013 and 2014.

- Limited soil moisture in the fall of 2013 and 2014 may have also affected the effectiveness of the fall tillage treatment. The fall vertical tillage pass did not penetrate the ground, as the land had experienced a dry late summer/fall with little precipitation.
- Without proper penetration of the implement into the soil, the implement is not able to achieve the proper residue incorporation/ chopping and soil fracturing capabilities it is designed for.
- Although the spring tillage treatments were better able to penetrate the soil compared to the fall tillage treatment, there was no observed advantage in plant density or grain yield compared to either the no-tillage or fall vertical tillage treatment.
- Fall and spring tillage using a light-duty vertical tillage implement with moderate levels of barley and wheat residue did not improve plant emergence or yield of crops when compared to a no-till system.
- There was a slight increase in soybean and corn emergence at the sampling dates 19 DAS, but the increase is likely attributed to warmer soil temperatures. The increase in plant density did not affect grain yield.
- Under no-till, low residue cereal-oilseed-pulse systems typical of northwest Saskatchewan, vertical tillage does not appear to improve plant density or seed yield for warm or cool season crops.



Figure 1. Stubble from main stubble plots on May 22, 2014 prior to seeding. From left to right: Spring vertical tillage, fall vertical tillage, no tillage



Figure 2. Salford vertical tillage implement used in demonstration