Evaluation of Row Unit Down Pressure Control and Closing Wheel Design under Various Corn Cropping Systems

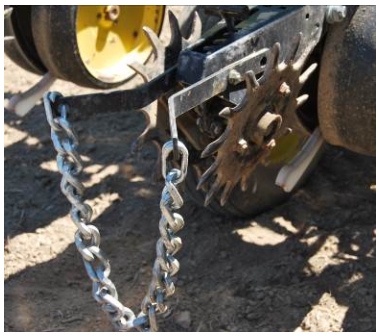
Purpose:

Aftermarket planter modifications have been well promoted into the Ontario marketplace, and are advertised for their ability to improve planter function, and final yields. The basic principles behind the modifications have merit, but the relative yield impacts of the different modifications, and their ability to respond above and beyond what is currently available in the marketplace is unknown, and has generally not been well investigated beyond anecdotal evidence. As a result, it is difficult to predict the returns these modifications would provide, making it difficult to make recommendations of when or where the use of these modifications may be most warranted.

Methods:

Three intensive trials were conducted at Bornholm, Lucan, and Ancaster, Ontario in 2013. The trials were arranged to compare the interaction of row unit down pressure and closing wheel type on corn growth and yield under both conventional and no-tillage conditions. Planting was completed with a 6-row John Deere 7200 Conservation planter equipped with no-till coulters as well as a Precision Planter 20/20 Airforce down pressure system equipped with both down-pressure and up-pressure airbags. A variety of automatic and manual down pressure settings were conducted across each location. Planter closing wheel type was investigated by comparing standard John Deere rubber closing wheels to three after-market spiked closing wheels (Martin Spiked, Schlagel Posi-Close and Copperhead Furrow-Cruiser), each simultaneously mounted across two row units (Figure 1). Tillage interactions with down pressure control and closing wheel type were investigated by comparing growth and yield under plots which either received fall (RTS coulter harrow equipped with tillage shanks) and spring (RTS coulter harrow only) tillage, or no tillage.

Figure 1. Three Closing Wheels Used For The Spiked Closing Wheel Treatments Across The Intensive Locations In 2013.



Martin Spiked

Schlagel Posi-Close

Copperhead Furrow-Cruiser

Treatments were replicated two to four times at each location, and were placed within existing corn fields. Fields ranged from flat (Bornholm, Lucan) to undulating topography (Ancaster). Planting conditions ranged from slightly tacky (Lucan) to very fit (Ancaster). All yield data was collected as whole plot weights by combine and weigh wagon. Location characteristics are presented in Table 1. Five "farm scale" trials were also conducted with co-operators who were equipped with corn planters with aftermarket down pressure controls. Crop and yield response to down pressure setting was the only factor investigated at these trials.

Table 1. Field Characteristics Of The Three Intensive Precision Planting Trials In 2013.

Location	Soil Texture	Soil pH	Organic Matter	P Soil Test	K Soil Test	Residue	Planting Date
				(ppm)	(ppm)		
Bornholm	Silt Loam	7.5	3.8	29	104	Wheat	May 7
Lucan	Silt Loam	7.5	3.6	31	111	Wheat	May 3
Ancaster	Silt Loam	6.4	2.9	10	63	Soybeans	May 16

Results:

The various treatments within the three main trial effects (down pressure, closing wheels, and tillage) had no significant impact on final corn yields at Bornholm or Lucan. At all site the "spiked closing wheel" value is an integrated number across all three of the closing wheels tested. At Ancaster, the three closing wheel styles were also compared head-to-head and the rubber closing wheels and Copperhead Furrow Cruisers both yielded slightly better that the Martin or Schlagel models. This may have been due to the relatively dry conditions at planting. When averaged across all spiked options the rubber closing wheels tended to yield higher (Table 2). In addition, automatic mode down pressure yielded significantly higher than the manual mode (Table 3). These influences were also observed in plant development at Ancaster, where the spiked closing wheel treatments where significantly less developed than the rubber closing wheel treatments based on leaf tip counts at the 7-8 leaf stage (data not shown).

Table 2. Corn yields as influenced by closing wheel selection at three "intensive" trials in Ontario, 2013.

Location	Closing Wheel Type	
	Rubber	Spiked
	-------- yield (bu/ac)† --------	
Bornholm	177 A	175 A
Lucan	181 A	179 A
Ancaster	170 A	164 B

† yield comparisons are valid within locations only, yields followed by the same letter are not significantly different at the 5% level

No significant interactions between the three main effects were observed at any locations, suggesting that yield response of one effect (i.e. closing wheel) did not depend on the treatment selection of another effect (i.e. tillage) at these locations in 2013.

Table 3. Corn Yields As Influenced By Down Pressure Setting At Three "Intensive" Trials In Ontario, 2013.

Location	Downpressure Treatment	Yield† (bu/ac)
Bornholm	Manual 0 lb	175 A
	Manual 125 lb	175 A
	Manual 250 lb	179 A
	Manual 375 lb	176 A
Lucan	Auto Heavy	180 A
	Auto Medium	181 A
	Manual Heavy	178 A
Ancaster	Manual (-60 lb margin)	164 B
	Auto Custom (40-80 lb margin)	169 A

† yield comparisons are valid within locations only, yields followed by the same letter are not significantly different at the 5% level

While the 0 lb downpressure treatment was the highest yielding across all "farm scale" trials (Table 4), no clear yield response was evident with increasing downpressure. At some locations (i.e. Dunnville 1, Dunnville 2), the high down pressure settings (400 lb) were more similar in yield to the 0 lb treatments than the mid-range (125 lb, 250 lb) treatments, while at other locations there was very little difference across down pressures (Staffa). The automatic treatments did not appear to provide any measurable yield improvements over the manual treatments at these locations in 2013.

Table 4. Corn Yields As Influenced By Down Pressure Setting At The Five "Farm Scale" Trials In Ontario, 2013.

Downpressure Treatment	Staffa	Glen Morris	Brantford	Dunnville 1	Dunnville 2
	---------- yield (bu/ac) ----------				
0 lb	206		180	153	162
125 lb	206			143	155
250 lb	206		172	141	150
400 lb	204		169	147	156
Auto Light					
Auto Standard	203	220		142	
Auto Heavy		230			155

Summary:

Despite achieving variability in planting conditions across locations, downpressure and closing wheel treatments only had a significant impact on yield at one location in 2013 where yield reductions where observed for the spike closing wheels and manual downpressure controls. Soil conditions were very fit at the time of planting for that location. These results are consistent with the previous year's results where significant differences between downpressure treatments were only observed at one of three locations. No interactions between the trial effects (downpressure, closing wheel, tillage) were observed at any location, suggesting yield response for treatments of some effects (i.e. closing wheel type) did not rely on the treatment selection of another effect (i.e. tillage) at these locations in 2013.

Next Steps:

This was a two year project and is now complete. The GHSCIA portion of the project will continue for a final year in 2014.

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