Precision Cropping Systems: Improving Efficiency and Sustainability (Interim Report)

Purpose:

To evaluate the agronomic and economic potential benefits of incorporating precision planter air bag down pressure equipment on modern corn planters. Farmers traditionally take the time to setup the planter in the first field planted, but there after tend to stay with the same setting despite changes in soil type, soil moisture and other conditions. This often means sub optimal planting especially where fields are variable.

The Precision Planting technology is supposed to be able to account for field variation and make on the go changes to optimize planter performance. The equipment has not been sufficiently researched to determine the flexibility of the equipment under varying field conditions and as to whether the technology pays to deploy. Two fundamental questions are does the automatic adjustment optimize planter performance leading to enhanced yield and secondly, does the system react quick enough to address significant changes in infield conditions or more on a field scale level.

Methods:

Using GHSCIA member planters which have been equipped with Precision Planters AirForce airbag system to facilitate on the changes in down pressure adjustment, the equipment will be evaluated to determine if the technology meets the needs of the producers. This equipment is used to change the down pressure ratings on an individual row unit basis as field conditions change across a field.

Participating producers operated from a standard protocol that identified treatment settings for the equipment. Five sites were established in 2012 with more planned for 2013 and 2014. Field conditions were dry for the most part in the spring of 2012 and there was not high expectation that the Precision Planting equipment treatment variations would show much response.

Treatments tested included manual and automatic settings at low, medium and high down pressure ratings.

Results:

Of the 5 sites evaluated during 2012, data from 3 sites is reported. At the first site in the Wainfleet area on a loam soil planted under ideal conditions, no differences in yield response to down pressure settings were observed (Figure 1). Obviously if the field conditions are optimal, there is no place for this technology or any other to enhance crop performance in the planting operation.

Two sites at Caledonia on heavier clay soil also saw no significant differences in planter performance with the various treatments evaluated (Figure 2 and 3). The site shown in Figure 3 was planted under poor conditions when the soil was required to be reworked following a rain. This soil is not responsive to tillage after it's already been worked. It was thought in this situation that the planting system might result in difference in crop performance but the field conditions were so poor and the field suffered throughout the remainder of the season because of a severe lack of rain. No real differences were observed even under these conditions.

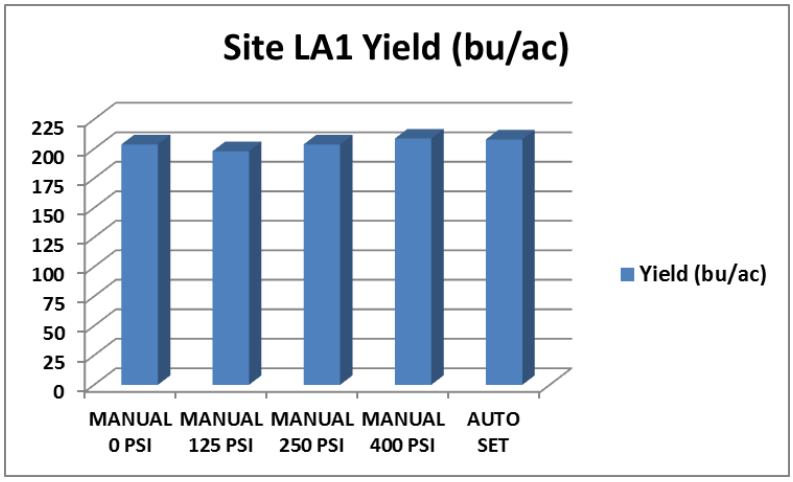

Figure 1: Yield Results from Planter Unit Down Pressure System on Loam Soil.

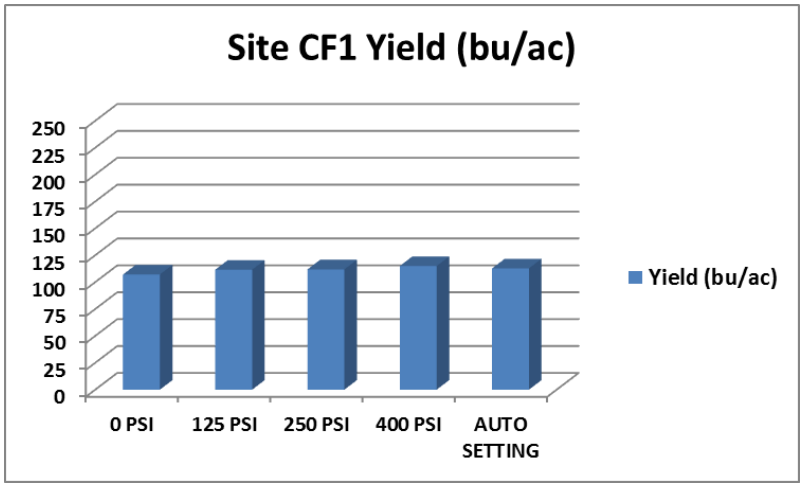

Figure 2: Yield Results from Planter Unit Down Pressure System on Clay Soil Planted in Good Field Conditions.

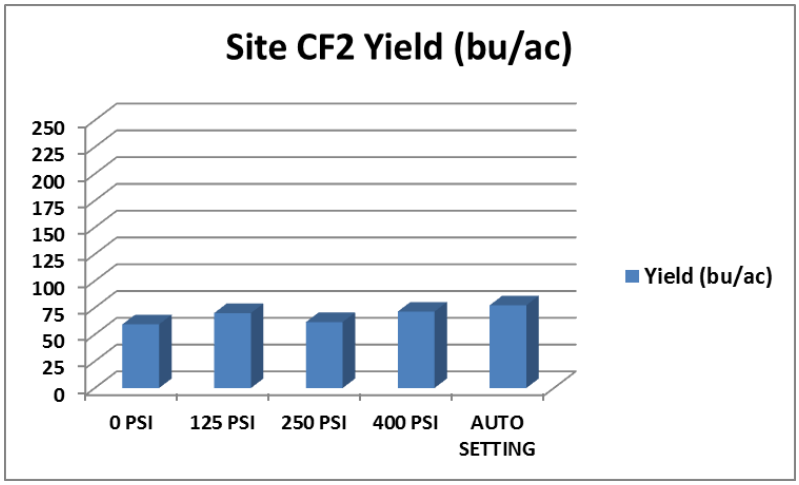

Figure 3: Yield Results from Planter Unit Down Pressure System on Clay Soil Planted in Poor Field Conditions.

In Figure 4, the results where only the modified system was tested with only down pressure control, the higher setting appears to have provided for higher yield than with the lower setting.

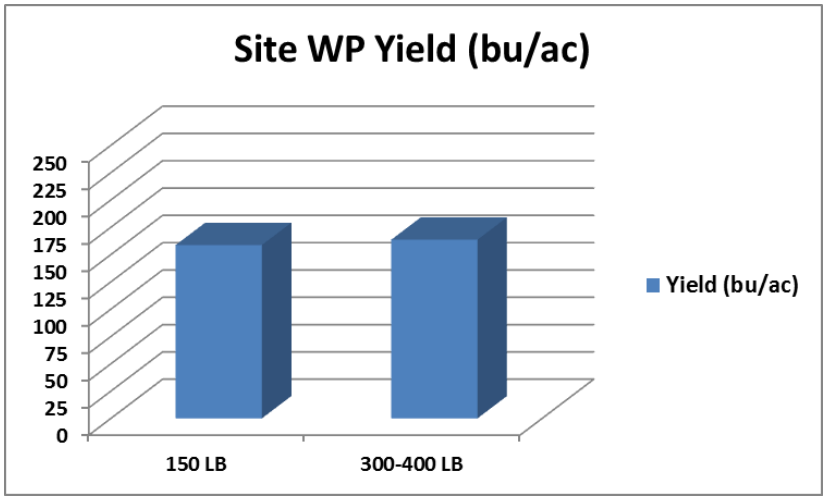

Figure 4: Yield Results from Brant Cty Site.

Population stand counts, distance between plants within the row and leaf counts were assessed (Table 1.). No conclusive differences were found from these assessments with the exception of the second site at Wainfleet (LA2) where the plant development was beyond a stage for accurate leaf tip assessments, so plant heights (leaves extended) was assessed. In this case, the significant differences observed were scattered across treatment settings and interpretation is difficult on a single site basis. At the Brant site, there was a significant treatment effect on plant population. The higher down pressure setting resulted in a significantly higher population then the light setting.

Summary:

In general the field conditions in the spring of 2012 were good and thus the abilities of the Precision Planting AirForce system were not adequately challenged to show a performance advantage from the investment. This is as expected since the system should benefit when used under marginal conditions to enhance planter performance across variable field conditions. Even in the third site reported, the conditions in this situation were beyond the ability of any system to improve yield performance.

Next Steps:

This was the first of a three year project and more cooperators will be lined up for the coming season.

Acknowledgements:

The participation of the farm cooperators and Tom Snyder of Grand River Planters (Precision Planting Dealer) are greatly appreciated as was the assistance of the University of Guelph students who conducted assessments.

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Location of Project Final Report:

Table 1: Plant Populations, In-Row Spacing, And Crop Stage Assessments By Site For Precision Planting Trials.

Year	Site	Treatment	Popln(,000's)		Spacing (cm)		Lf Tips (#) or Plant Height (cm)	
			Average		Average			
2012	CF1	0 PSI	30.5	NSD	17.4	NSD	13.1	NSD
2012	CF1	125 PSI	29.3		17.8		12.8	
2012	CF1	250 PSI	30.3		17.7		11.9	
2012	CF1	400 PSI	27.5		19		13.2	
2012	CF1	AUTO SETTING	28		18.9		13.1	
2012	CF2	0 PSI	28.5	NSD	21.8	NSD	10.2	NSD
2012	CF2	125 PSI	25.7		23.6		10.4	
2012	CF2	250 PSI	26.7		23.2		10.5	
2012	CF2	400 PSI	28.5		21.2		10.3	
2012	CF2	AUTO SETTING	24.5		24.9		10.2	
2012	LA1	0 PSI	22.5	NSD	28.2	NSD	13.4	NSD
2012	LA1	125 PSI	23		27.1		13.2	
2012	LA1	250 PSI	21.3		30.9		12.9	
2012	LA1	400 PSI	23		27.2		13.3	
2012	LA1	AUTO SET	22.8		28.2		12.9	
2012	LA2	LIGHT SETTING NO AF	25.5	NSD	26.2	NSD	109.5	C
2012	LA2	STANDARD SETTING NO AF	25.8		25.5		139.8	A
2012	LA2	HEAVY SETTING NO AF	25.3		26.1		128.4	B
2012	LA2	LIGHT SETTING AF	25.5		25.3		121.9	B
2012	LA2	STANDARD SETTING AF	24.3		27.2		143.4	A
2012	LA2	HEAVY AUTO	25.8		25.3		144.9	A
2012	WP	20 PSI/150 LB	30.8	*	16.8	NSD	8	NSD
2012	WP	70 PSI/300-400 LB	34.7		16.5		8	