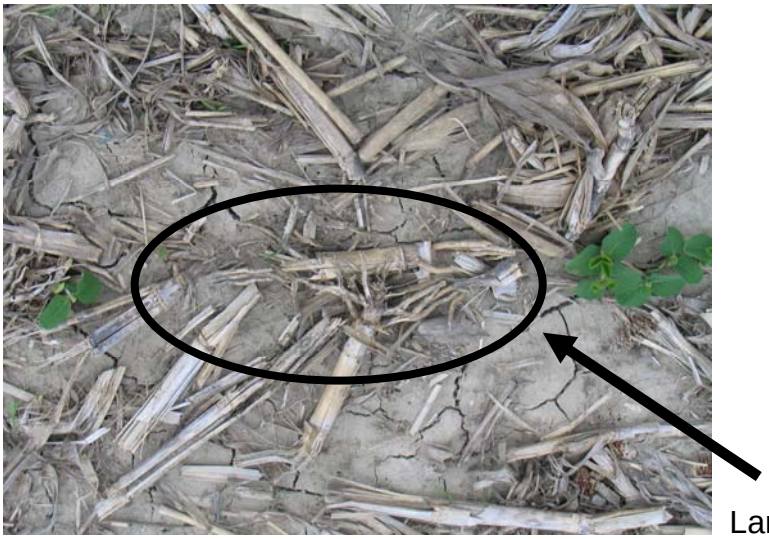
Reducing Soybean Seed Costs through Precision Seeding (2006 Interim Report)

Purpose:

Traditional seed drills do a poor job of distributing seed evenly resulting in clumping of seed, leaving large gaps within the row. See Picture #1. A planter allows for precise seed metering, resulting in more uniform stands. It also allows for better depth control. There has been speculation that more accurate seed placement may allow for lower seeding rates compared to a drill and result in higher yields. In the case of glyphosate tolerant varieties soybean seed has become the largest single input in soybean production (approximately $50/acre). Lower seeding rates could significantly reduce this input cost.

This study investigated the most profitable soybean seeding rate for 15 inch row spacing using a row planter. It also compared 15" rows seeded with a planter, to 15" rows seeded with a drill and 7.5" rows seeded with a drill.

Picture #1 Emerging seedlings seeded with a no-till drill.



Large gaps in the row

Methods:

Eight large scale replicated trials were conducted over the past two growing seasons. Various 15" row planters were compared to a JD 1560 no-till drill with every other run plugged (15" row spacing) and all runs open (7.5" rows). All sites were no-till and different seeding rates were tested.

Each treatment was 20 feet wide with a minimum length of 1200 feet. Most sites were field length strips (>1500 feet). In total, 8 sites were harvested with a minimum of two replications per site.

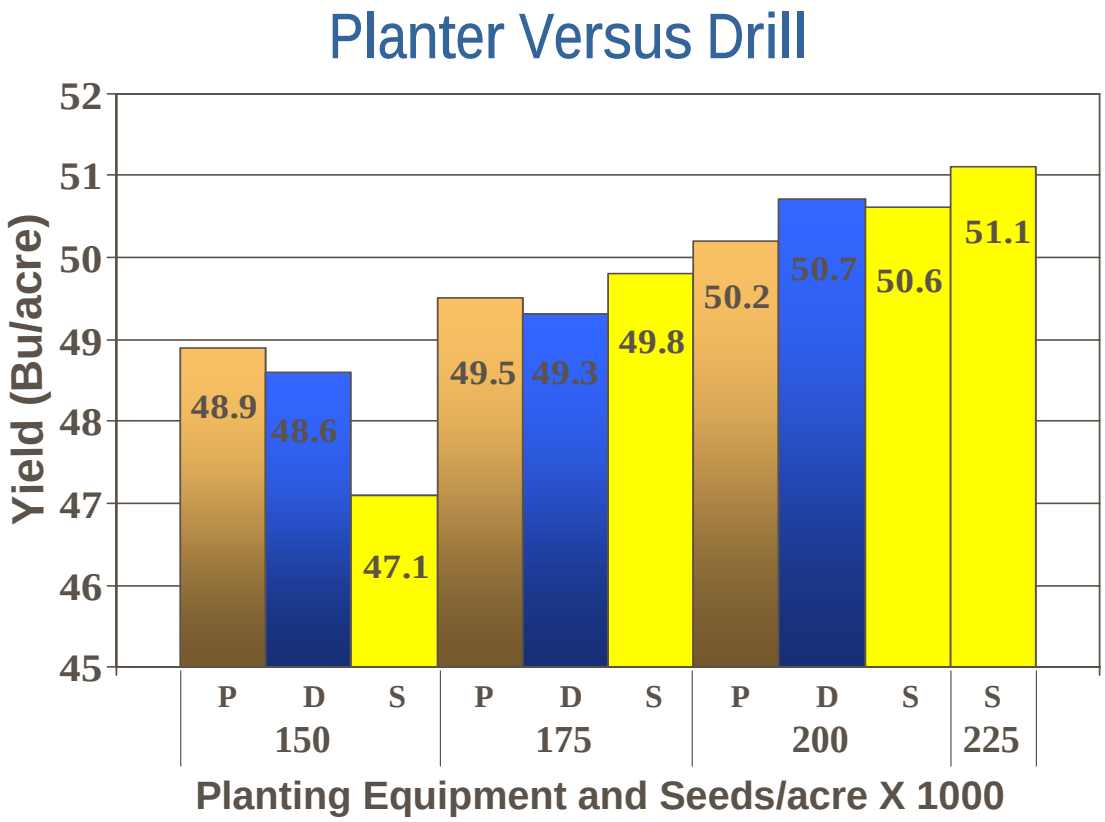
Trials included all the following treatments:

Row Width	Seeding Rate (x 1000)			
7.5 inch drill	150	175	200	225
15 inch drill	150	175	200	
15 inch planter	150	175	200	

Fields were treated as a whole when applying herbicides, fertilizers, and tillage practices. Crop inputs were applied perpendicular to the direction of the treatments. This ensured that mistakes or misses in field operations occurred across all trial treatments.

Results and Summary:

Figure 1



P = Planter (15" rows), D = Drill (15" rows), S = Solid Seeded Drill (7.5" rows)

LSD 10% = 1.9

Although the planter units did a superior job in seed distribution, that did not translate into higher yields compared to the drill at the same seeding rate. The 15" drill produced equivalent yield to the three seeding rates as did the 15" planter averaged across all sites. At 1 out of the 8 sites there was a 3 bu/ac advantage to the planter. At all the other sites the increased accuracy of the planter compared to the drill had no significant

impact on yield. This is surprising, especially at the lowest seeding rate. 30 days after seeding the planter rows looked superior because of better spacing. But the gaps resulting from using the drill did not reduce yields. This is likely because of the soybean plant's ability to compensate for gaps and may also be a reflection of the good growing conditions over the last two years. We intend to conduct these trials one more year before final conclusions are drawn. Keep in mind, that a planter is superior when using very low seeding rates. This has been shown in other research studies. Under extremely low seeding rates (50 000 – 100 000 seeds/acre) the planter will provide significantly better yields compared to a seed drill.

This study has also showed an increase in yields with increased populations from 150 000 seeds/acre to 200 000 seeds/acre. In each case when seeding rates were increased yields increased. It's worth noting that the benefit from increasing the seeding rate was different for the planter compared to the drill. Raising the seeding rate from 150 to 200 with a planter only increased yields by 1.3 bu/ac. Increasing the rate from 150 to 200 with a 15" drill increased yields by 2.1 bu/ac and increasing the seeding rate from 150 to 200 in 7.5" rows increased yields by 3.5 bu/ac. This confirms that higher seeding rates are important for drills but not as crucial for planters. Assuming a seed cost of $32 per unit, a seed size of 2700 seeds/lb, and a selling price of $7.00 per bushel, the return for increasing the seeding rate from 150 000 seeds/acre to 200 000 seeds/acre is significantly different for the two pieces of equipment. Increasing the seeding rate for the 7.5" drill increased profits by $12.65/acre. Increasing the seeding rate for the 15" drill increased profits by $2.85/acre. However, increasing the seeding rate with a 15" planter actually reduced profits by $2.75/acre.

Table 1: Gross Return Minus Seed Costs at Various Seeding Rates

	Increased Return of 200 000 over 150 000 seeds/acre
Solid Seeded (7.5")	$12.65
Drill (15")	$2.85
Planter (15")	$-2.75

Numbers based on $32.00/unit, 2700 seeds/lbs seed, $7.00/bushel selling price, and yield results from Figure 1. All inputs except for the cost of seed are assumed to be the same regardless of seeding rate and are not included in this comparison.

The conclusions from this study so far are clear:

1) At normal seeding rates (175 – 200) there was no significant yield difference between the 15" planter compared to the drill seeded in either 7.5" or 15" rows.
2) Lower seeding rates yielded less than higher seeding rates in this study but reductions were relatively small.
3) The highest statistical yield was at 200 000 seeds/acre for all three implements
4) The highest economic return for the drill was at 200 000 seeds/acre but was 150 000 seeds/acre for the planter.

Next Steps:

This study will be conducted for one more year and will be completed by the fall of 2007. In 2007 even lower seeding rates will be compared.

Acknowledgements:

The Ontario Soil and Crop Improvement Association (OSCIA) members that conducted the trials, the *Heartland Regional OSCIA* and the *Ontario Soybean Growers* for funding this project, and the Middlesex Soil & Crop Improvement Association for making available their no-till drill at a reduced cost.

Project Contacts:

Stay tuned for future results and contact Horst Bohner, horst.bohner@ontario.ca if you wish to be involved in 2007.