Reducing Soybean Seed Costs Through Lower Seeding Rates And Precision Seeding

(2005 Interim Report)

Purpose:

This study was designed to determine the most profitable soybean seeding rate and row width for various CHU regions, soil types, and planting dates across Ontario. For instance, is it possible to lower seeding rates to 175,000 seeds/acre in 15 inch (432,000 seeds/ha in 38cm) rows and 200,000 seeds/acre in 7 inch (494,000 seeds/ha in 18cm) rows without sacrificing yield? Is it possible to attain the same yields in 15 inch (30cm) rows as apposed to 7 inch (18 cm) rows in field scale trials?

Currently OMAFRA seeding rate recommendations are based on research conducted with conventional varieties, untreated seed, and with less precise planting equipment than is now available. Current OMAFRA seeding recommendations for the whole province are:

225,000 seeds/acre in 7 inch rows, (556,000 seeds/ha in 18cm rows)
200,000 seeds/acre in 15 inch rows, (494,000 seeds/ha in 38cm rows)
170,000 seeds/acre in 22 inch rows, (420,000 seeds/ha in 56cm rows)
160,000 seeds/acre in 30 inch rows. (395,000 seeds/ha in 76cm rows)

Several studies have demonstrated that for most soil types, maximum economic yields are attainable from stands having a minimum of 150,000 healthy plants/acre 371,000 plants/ha) at harvest.

If recommended seeding rates could be reduced by 12-15% (ie. from 225,000 to 200, 000 seeds/acre in 7.5 inch, 556,000 to 494,000 seeds/ha in 18cm rows) and still achieve maximum yields, a significant savings in seeding cost could be achieved. This reduced seeding rate would represent an approximate $6.75 per acre ($16.68/ha) savings, assuming a $35.00 per unit cost of Roundup Ready seed with 2600 seeds/pound. If a producer could switch from 7.5 inch (19cm) rows to 15-inch (38cm)rows, that producer would save $13.50 per acre ($17.63/ha) in seed costs (reducing seeding rates from 225,000 to 175,000 seeds per acre, 556,000 to 432,000 seeds/ha). At present, little Ontario field scale data is available on which to base seeding rate recommendations when taking into account the availability of a new technology such as glyphosate tolerant varieties, seed treatments, soil type variation, and precision seeding equipment. These new technologies have significantly changed the potential of establishing vigorous soybean stands, making the study of lower seeding rates necessary.

Methods:

This project compared plant stands and final yields of 7.5 inch (19cm) rows compared to 15 inch rows at various seeding rates, soil types, and planting dates. All trials were no-till (Picture #1). Each treatment was 20 feet (6m) wide with a minimum length of 1200 feet 365 m). Most sites were field length strips.(>1500 feet, 457m) In total, 12 sites were harvested with a minimum of two replications per site. At three of the sites, two different planting dates were seeded. The two planting dates included the ideal planting date (May 10-25) and a late planting date.

Row Width in (cm)	Seeding Rate (x 1000) seeds/ac (seeds/ha)	
7.5 (19)	200 (494)	225 (556)
15 (38)	175 (432)	200 (494)

Table 1. Each strip trial assessed the following seeding rates:

Row Width in (cm)	Seeding Rate (x 1000) seeds/ac (seeds/ha)			
7.5 (19)	150 (370)	175 (432)	200 (494)	225(556)
15 (38)	150 (370)	175 (432)	200 (494)	

Table 2. Whenever practical, sites included all the following treatments:

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.

A late season infestation of soybean aphids required control measures on some of the fields. This late season insecticide was applied in the same direction as the treatments. Strips with late season sprayer tracks were harvested but not included in the statistical analysis of the data. Trials were weighed with a weigh wagon.

Picture 1. Seeding of Various Row Widths and Seeding Rates

Picture 2. Soybean Emergence of 7.5 Inch vs 15 Inch Rows

Results:

The results from this years trials are summarized in tables 3 and 4.

Table 3: Average Soybean Plant Stands. 2005 Results

Treatment Imp (metric)	Average plants/ac (plants/ha)
7" 225 (19cm 556)	165,301 (408,459)
7" 200 (19cm 494)	142,959 (353,252)
7" 175 (19cm 432)	127,808 (315,814)
7" 150 (19cm 370)	101,406 (250,574)
15" 200 (38cm 494)	152,362 (376,487)
15" 175 (38cm 432)	135,274 (334,262)
15" 150 (38cm 370)	110,434 (272,882)

Table 4: Planting Rate Yield Results for 2005

Treatment Imp (metric)	Yield ** bu/ac (t/ha)
7" 225 (19cm 556)	47.6 (3.20) a
7" 200 (19cm 494)	48.1 (3.23) a
7" 175 (19cm 432)	45.9 (3.09) b
7" 150 (19cm 370)	45.1 (3.03) b
15" 200 (38cm 494)	47.6 (3.20) a
15" 175 (38cm 432)	45.6 (3.07) b
15" 150 (38cm 370)	45.5 (3.06) b

**Values followed by the same letter are not significantly different at the 5% level.

The spring of 2005 was relatively dry throughout much of southwestern Ontario. This was beneficial for timely planting, but it was so dry that seed germination and emergence was reduced by lack of moisture. On average only 73% of the seed planted emerged in this study. Field experience has shown that an 80% emergence rate can be expected in no-till soybeans fields in an average year. These reduced emergence rates must be taken into consideration when interpreting this year's results.

In this experiment, the highest yields resulted from the following three seeding rates:

225,000 seeds/acre in 7" rows, (556,000 seeds/ha in 18cm rows)
200,000 seeds/acre in 7" rows, (494,000 seeds/ha in 18cm rows)
200,000 seeds/acre in 15" rows, (494,000 seeds/ha in 38cm rows)

These three seeding rate/row width treatments had statistically equal yields.

The following treatments all resulted in statistically lower yields compared to the treatments listed above:

175,000 seeds/acre in 7" rows, (432,000 seeds/ha in 18cm rows)
150,000 seeds/acre in 7" rows, (370,000 seeds/ha in 18cm rows)
175,000 seeds/acre in 15" rows, (432,000 seeds/ha in 38cm rows)
150,000 seeds/acre in 15" rows. (370,000 seeds/ha in 38cm rows)

These four treatments all produced statistically equal yields.

Summary:

Results from the first year of this study indicate that seeding rates could be reduced to 200, 000 seeds/acre (494,000 seeds/ha) when planting in either 7" (18 cm) rows or 15" (38 cm) rows. A saving in seed cost of approximately $6.75 per acre could be realized by reducing seeding rates from 225 000 to 200 000 (556,000 to 494,000) in 7.5" (18 cm) rows, or by converting from 7.5" (18 cm) row spacing at a seeding rate of 225,000 (556,000) to a 15" (38 cm) row spacing at a seeding rate of 200 000 seeds/acre (494,000 seeds/ha). (These savings are based on a cost of $35.00 per bag of Roundup Ready seed with 2600 seeds/pound.)

2005 average trial results showed no yield difference between 7.5" (18 cm) rows and 15" (38 cm) rows, regardless of the Crop Heat Unit area or planting date. There was also no difference in the results based on whether the seed was treated with a fungicide. Glyphosate tolerant and conventional varieties behaved the same in this study.

Reducing seeding rates in 15" (38 cm) rows from 200,000 seeds/acre (494,000 seeds/ha) to 175,000 (432,000) caused a loss of 2.0 bu/ac 134 kg/ha) in this study. This would result in a net loss of approximately $7.25 per acre (based on $7.00/bu and a seed saving of $6.75). The first year of this study would suggest that lowering the seeding rate in 15” (38 cm) rows cannot be recommended.

Results in 2005 were similar for soil type, planting date, and CHU’s area.

Next Steps:

This study will be conducted for two more years and will be completed by the fall of 2007. In 2006 and 2007, planters will be compared to seed drills with trials conducted on heavy clay soils where it’s believed that lower seeding rates may be more problematic.

Acknowledgements:

Special thanks to all those who participated in the project:
The SCIA members that conducted the trials,
The *Heartland Regional SCIA* and the *Ontario Soybean Growers* for funding this project,
Middlesex Soil & Crop Improvement Association for making available their no-till drill,
Podolinsky Equipment for providing a tractor at a reduced cost.

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