On-Farm Corn and Soybean Planter Trials

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Introduction

Corn and soybean planting is one of the most critical operations of the season. Operating the planter with the proper soil conditions for proper placement of the seed to obtain the correct seed-soil contact is important to optimize yields and reduce problems later in the season with plant and root growth. As corn and soybean seed prices continue to rise, and grain prices fall, it is important for farmers to find a population that maximizes both yield and profit. Planting too high of a corn population can result in increased barrenness and thus lower yields, but too low of a population also can result in lower yields. Past studies have indicated soybean yields are similar across a wide range of populations, but too low of a population can result in reduced yields and too high of a population can reduce profits. The objective of these trials was to investigate the effect of various planter operations on corn and soybean yield.

Materials and Methods

In 2016, nine trials investigated the effects of various aspects of corn planter operations on corn yield (Table 1), and six trials investigated the effects of various planter operations on soybean yield (Table 2). All trials were conducted on-farm by farmer cooperators using the farmer's equipment. Strips were arranged in a randomized complete block design with at least three replications per treatment. Strip length and width varied from field to field depending on field and equipment size. All plots were machine harvested for grain yield.

In corn Trial 1, each row was harvested separately with a 16-row planter to see if there were any differences in yield (Table 3). In Trials 2 and 3, the effect of planter speed on corn yield was investigated. Trial 4 compared using precision planting E-set plates to John Deere 30 cell plates. Trials 5, 6, 7, and 9 investigated the effect of plant population on corn yield. Trial 8 investigated possible problems from soil compaction caused by the planter by comparing corn yield from rows planted with the center of the planter with rows planted with the planter wings. The planter in this study had a bulk center fill tank for the corn seed, which would have resulted in more weight in the center of the planter and thus more potential for soil compaction.

In soybean Trials 1 and 2, the effect of row width on soybean yield was investigated (Table 4). In Trial 3, three populations were planted on two planting dates with both an early-maturing and a late-maturing variety. Trials 4, 5, and 6 investigated the effect of plant population on soybean yield.

Results and Discussion

In corn Trial 1, one outside row yielded about 15 bushels/acre more than the other 15 rows. It is not known what might have caused this yield difference, although it could be due to a slight difference in how this planter unit was adjusted, such as slightly deeper or more shallow planting depth or more or less down

pressure. In Trial 2, corn planted with the faster planting speed of 8 mph yielded six bushels/acre more than corn planted with the 6 mph speed ($P = 0.08$), but there was no significant difference in corn yield with the three planting speeds in Trial 3. In Trial 4, there was no yield difference between the rows planted using precision planting E-set plates and the rows planted using John Deere 30 cell plates. In Trial 5, the lowest seeding rate of 28,000 seeds/acre yielded less than the higher seeding rates ($P = 0.06$), but in Trials 7 and 8, corn planted with the 28,000 seeds/acre seeding rate yielded as high as corn planted with the higher seeding rates. In Trial 9, corn planted with seeding rates of 29,000 seed/acre yielded the same as corn planted with higher seeding rates, and there was no difference in yield between the two hybrids in the study. Most past research has shown the optimal planting rate for corn yield falls in a range from about 35,000 to 37,000 seeds/acre. These studies indicate there may be opportunities for farmers to reduce their seeding rates, although results will likely vary from year to year.

In soybean Trial 1, there was no difference in yield between the soybean planted in 15-in. rows and the soybean planted in 30-in. rows, but in Trial 2, the soybean planted in 30-in. rows yielded 3 bushels/acre more than the soybean planted in 15-in. rows (Table 4). Most studies have shown if there is a yield advantage, it is usually soybean planted with the narrow rows that out-yield soybean in wider rows, unless white mold or other disease problems are in the field.

In Trial 3, there were many yield differences among the various variety, population, and planting date combinations. The early maturing variety yielded an average of 81 bushels/acre, which was significantly more than the 75 bushels/acre the late maturing variety yielded, and the soybean planted early yielded an average of 80 bushels/acre, which was significantly more than the 75 bushels/acre the late planted soybean yielded at $P < 0.01$ (data not shown). The soybean planted at 100,000 seeds/acre yielded an average of 76 bushels/acre, which was significantly less than the 79 bushels/acre soybean planted at 150,000 seeds/acre, but not significantly less than the 78 bushels/acre soybean planted at 125,000 seeds/acre yielded at $P = 0.01$ (data not shown). There were no significant differences in soybean yield with the seeding rates used in Trials 4, 5, and 6, with seeding rates as low as 100,000 seeds/acre yielding the same as higher seeding rates. It is usually recommended to seed about 140,000 seeds/acre in order to have a final plant stand of 100,000 plants/acre or more, but as other studies have shown, lower seeding rates often can be used without a yield penalty.

Table 1. Hybrid, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 planter trials on corn.

Exp. no.	Trial	County	Hybrid	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160503	1	Story	Agrigold 6559	30	4/15/16	34,000	Soybean	Spring field cultivated
160113	2	Lyon	Pioneer PO339	22	5/12/16	VR 37,000	Corn	Conventional
160821	3	Howard	LG 5470	30	4/27/16	34,100	Corn	No-till
160110	4	Sioux	Pioneer PO533AM1	30	4/26/16	34,000	Soybean	Conventional
160105	5	Sioux	Pioneer PO157AM	30	5/16/16	28,000, 32,000, 36,000	Soybean	Conventional
160132	6	Lyon	Dekalb DK5284 & DK 5261	30	5/2/16	29,000 32,000, 35,000 38,000	Soybean	Conventional
160305	7	Monona	LG2549VT2	30	5/6/16	28,000 32,000, 36,000	Soybean	No-till
160134	8	Lyon	Wensman W1011	30	5/18/16	34,000	Soybean	No-till
160306	9	Monona	Wyffels 7456VT2	30	5/6/16	28,000 32,000, 36,000	Soybean	No-till

Table 2. Variety, row spacing, planting date, planting population, previous crop, and tillage practices in the 2016 planter trials on soybean.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
160410	1	Kossuth	LG 2259LL	15 & 30	5/22/16	150,000	Corn	No-till
160825	2	Bremer	IA 2067	15 & 30	5/12/16	142,000	Corn	No-till
160103	3	Sioux	Pioneer P18T85R & 27T03R	30	5/5/16 & 5/21/16	100,000 & 125,000 & 150,000	Corn	No-till
160114	4	Lyon	Asgrow 1935	22	5/17/16	100,000 & 132,000	Corn	Conventional
160208	5	Pocahontas	Syngenta S 25L-9	30	5/17/16	154,000 & 165,000	Corn	Chisel, field cultivate
160705	6	Henry	Pioneer P28T08	30	4/26/16	132,000 & 155,000	Corn	Fall chisel, spring field cultivate

Table 3. Yields for on-farm corn planter trials in 2016.

Exp. no.	Trial	Treatment	Yield (bu/ac)[a]	P-value[b]
160503	1	Row 1	258 a	<0.01
		Row 2	243 b	
		Row 3	246 b	
		Row 4	238 b	
		Row 5	248 ab	
		Row 6	240 b	
		Row 7	241 b	
		Row 8	245 b	
		Row 9	240 b	
		Row 10	243 b	
		Row 11	242 b	
		Row 12	242 b	
		Row 13	242 b	
		Row 14	240 b	
		Row 15	244 b	
		Row 16	242 b	
160113	2	Corn planted at 8 mph	244 a	0.08
		Corn planted at 6 mph	238 a	
160821	3	Corn planted at 7.5 mph	208 a	0.28
		Corn planter at 6.5 mph	223 a	
		Corn planted at 5.5 mph	202 a	
160110	4	Precision planting E-set plates	248 a	0.18
		John Deere 30 cell plates	252 a	
160105	5	Corn planting population of 28,000 seeds/ac	223 a	0.06
		Corn planting population of 32,000 seeds/ac	237 a	
		Corn planting population of 36,000 seeds/ac	235 a	
160132	6	Corn planting population of 28,000 seeds/ac	202 a	0.48
		Corn planting population of 32,000 seeds/ac	206 a	
		Corn planting population of 36,000 seeds/ac	202 a	
160305	7	Corn planting population of 28,000 seeds/ac	224 a	0.46
		Corn planting population of 32,000 seeds/ac	228 a	
		Corn planting population of 36,000 seeds/ac	233 a	
160134	8	Corn planted in center 12 rows	229 a	0.21
		Corn planted in outside 12 rows	224 a	
160306	9	Dekalb DK5284 at 29,000 seeds/ac	235 a	0.41
		Dekalb DK5261 at 29,000 seeds/ac	226 a	
		Dekalb DK5284 at 32,000 seeds/ac	230 a	
		Dekalb DK5261 at 32,000 seeds/ac	228 a	
		Dekalb DK5284 at 35,000 seeds/ac	231 a	
		Dekalb DK5261 at 35,000 seeds/ac	225 a	
		Dekalb DK5284 at 38,000 seeds/ac	227 a	
		Dekalb DK5261 at 38,000 seeds/ac	230 a	

[a]Values denoted with the same letter within a trial are not statistically different at the significance level of 0.05.
[b]P-value = the calculated probability that the difference in yields can be attributed to the treatments and not other factors. For example, if a trial has a P-value of 0.10, then we are 90 percent confident the yield differences are in response to treatments. For P = 0.05, we would be 95 percent confident.

Table 4. Yields for on-farm soybean planter trials in 2016.

Exp. no	Trial	Treatment	Fall stand count (plants/ac)[a]	Yield (bu/ac)[a]	P-value (yield)[b]
160410	1	30-in. row spacing		60 a	0.42
		15-in. row spacing		62 a	
160825	2	30-in. row spacing		56 a	0.02
		15-in. row spacing		53 b	
160103	3	Early maturing variety planted early at 100,000 seeds/ac		82 ab	<0.01
		Early maturing variety planted early at 125,000 seeds/ac		85 a	
		Early maturing variety planted early at 150,000 seeds/ac		85 a	
		Early maturing variety planted late at 100,000 seeds/ac		76 cdef	
		Early maturing variety planted late at 125,000 seeds/ac		78 bcde	
		Early maturing variety planted late at 150,000 seeds/ac		79 bcd	
		Late maturing variety planted early at 100,000 seeds/ac		75 cdef	
		Late maturing variety planted early at 125,000 seeds/ac		77 cdef	
		Late maturing variety planted early at 150,000 seeds/ac		80 abc	
		Late maturing variety planted late at 100,000 seeds/ac		71 f	
		Late maturing variety planted late at 125,000 seeds/ac		73 ef	
		Late maturing variety planted late at 150,000 seeds/ac		73 def	
160114	4	Planting population of 100,000 seeds/ac		84 a	0.68
		Planting population of 132,000 seeds/ac		83 a	
160208	5	Planting population of 154,000 seeds/ac	146,800 a	67 a	0.84
		Planting population of 164,000 seeds/ac	158,900 b	67 a	
160705	6	Planting population of 132,000 seeds/ac		72 a	0.48
		Planting population of 150,000 seeds/ac		71 a	

[a]Values denoted with the same letter within a trial are not statistically different at the significance level of 0.05.
[b]P-value = the calculated probability that the difference in yields can be attributed to the treatments and not other factors. For example, if a trial has a P-value of 0.10, then we are 90 percent confident the yield differences are in response to treatments. For P = 0.05, we would be 95 percent confident.