On-Farm Corn and Soybean Planter Demonstration 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 2017, eight 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.

Corn Trial 1 compared using precision planting E-set plates with John Deere 30 cell plates (Table 3). In Trial 2, the effect of planter speeds from 4 mph to 7.5 mph on corn yield was investigated. Trials 3, 4, 5, 6, 7, and 8 investigated the effect of two to three seeding rates on corn yield. Trial 5 also investigated using two different nitrogen (N) rates with the three different seeding rates. A preplant N rate of 170 lb N/acre with or without an additional rate of 50 lb N/acre side-dressed at V6 crop growth stage was investigated in Trial 5.

In soybean Trial 1, soybeans planted in late April were compared with soybeans planted in mid-May (Table 4). In Trial 2, the effect of row width on soybean yield was investigated. In Trials 3, 4, 5, and 6, the effect of seeding rate on soybean yield was investigated.

Results and Discussion

In corn Trial 1, corn planted using John Deere 30 cell plates yielded seven bushels/acre more than corn planted with precision planting E-set plates (Table 3). It is not known why this yield difference occurred. In Trial 2, there was no difference in corn yield with planting speeds ranging from 4 to 7.5 mph. In Trials 3, 4, and 7, there was no difference in corn yield with the three different seeding rates, with seeding rates varying from 28,000 to 39,000 seeds/acre. In Trial 5, there was no difference in corn yield with the three seeding rates from 34,500 to 38,000 seeds/acre and no difference

in corn yield with the two nitrogen fertilizer rates. In Trials 6 and 8, there was a higher yield with the lowest seeding rate of 34,000 seeds/acre compared with a seeding rate of 36,000-38,000 seeds/acre ($P \leq 0.07$). Based on these trials it is apparent seeding rates of 34,000 seeds/acre or less is adequate for maximum corn yields. Thus, there may be opportunities for some 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 soybeans planted in late April compared to soybeans planted in mid-May (Table 4). It is usually recommended to plant soybeans in late April to early May for maximum yields. In Trial 2, soybeans planted in 30-in. rows yielded four bushels/acre more than soybeans planted in 15-in. rows ($P = 0.07$). There was more white mold present in the soybeans planted in the 15-in. rows, which may have been responsible for the lower yield. 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 Trials 3, 5, and 6, there was no difference in soybean yield with the different seeding rates, with seeding rates varying from 125,000 seeds/acre to 180,000 seeds/acre. In Trial 4, the highest seeding rate of 150,000 seeds/acre resulted in a higher soybean yield than seeding rates of 90,000 to 130,000 seeds/acre ($P = 0.02$). 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. The results of these trials support that recommendation.

NOTE: The results presented are from replicated demonstration trials. Statistics are used to detect differences at a location and should not be interpreted beyond the single location.

Table 1. Hybrid, row spacing, planting date, planting population, previous crop, and tillage practices in the 2017 planter trials on corn.

Exp. no.	Trial	County	Hybrid	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
170113	1	Sioux	Pioneer PO589AMX	30	4/24/17	34,000	Soybean	Conventional
170810	2	Howard	Pfister 6081	30	5/17/17	36,000	Corn	No-till
170207	3	Crawford	Curry 826-64AMX	30	5/20/17	30,000, 34,000, 38,000	Corn	Fall disk, spring field cultivate
170301	4	Monona	Wyffels 7456VT2	30	5/26/17	28,000, 32,000, 36,000	Corn	No-till
170401	5	Hancock	Becks 5441SX RIB	30	5/8/17	34,500, 36,500, 38,000	Soybean	Conventional
170706	6	Washington	Dekalb DK6435	30	4/17/17	34,000, 36,000	Soybean	No-till
170812	7	Howard	Pioneer PO574AM	30	5/10/17	33,000, 36,000, 39,000	Corn	No-till
170823	8	Bremer	New Tech 5F-504	30	5/10/17	34,000, 38,000	Corn	No-till

Table 2. Variety, row spacing, planting date, planting population, previous crop, and tillage practices in the 2017 planter trials on soybean.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
170119	1	Sioux	Pioneer P18T85R	30	4/24/17 and 5/15/17	140,000	Corn	No-till
170127	2	Lyon	Becks 185R2	15 and 30	5/10/17	140,000	Corn	Strip till
170128	3	Osceola	Asgrow A20XY	30	5/13/17	125,000, 150,000, 175,000	Corn	Conventional
170129	4	Sioux	Pioneer P24T56L	30	5/11/17	90,000, 110,000, 130,000, 150,000	Soybean	No-till
170213	5	Pocahontas	Syngenta S20T6	30	5/15/17	149,735, 179,742	Corn	Chisel, field cultivate
170408	6	Franklin	Syngenta S26-P3	30	5/12/17	145,000 165,000	Corn	Conventional

Table 3. Yields for on-farm corn planter trials in 2017.

Exp. no.	Trial	Treatment	Spring stand count (plants/ac)	Fall stand count (plants/ac)	Yield (bu/ac)[a]	P-value[b]
170113	1	Planted with Precision E-set plates			261 a	0.01
		Planted with John Deere 30 cell plates			268 b	
170810	2	Planted at 4.0 miles/hour			198 a	0.57
		Planted at 5.0 miles/hour			200 a	
		Planted at 5.5 miles/hour			203 a	
		Planted at 6.0 miles/hour			195 a	
		Planted at 6.5 miles/hour			187 a	
		Planted at 7.0 miles/hour			205 a	
		Planted at 7.5 miles/hour			205 a	
170207	3	Planted at 30,000 seeds/ac	28,300 a	27,000 a	230 a	0.19
		Planted at 34,000 seeds/ac	31,000 b	30,500 b	236 a	
		Planted at 38,000 seeds/ac	35,300 c	34,600 c	236 a	
170301	4	Planted at 28,000 seeds/ac	28,600 a	28,000 a	214 a	0.17
		Planted at 32,000 seeds/ac	32,400 b	31,900 b	225 a	
		Planted at 36,000 seeds/ac	36,900 c	35,800 c	234 a	
170401	5	Planted at 34,500 seeds/ac with 170 lb/ac N as UAN preplant			298 a	0.34
		Planted at 34,500 seeds/ac with 170 lb/ac N as UAN preplant plus 50 lb/ac N as UAN sidedress at V6			294 a	
		Planted at 36,000 seeds/ac with 170 lb/ac N as UAN preplant			300 a	
		Planted at 36,000 seeds/ac with 170 lb/ac N as UAN preplant plus 50 lb/ac N as UAN sidedress at V6			299 a	
		Planted at 38,000 seeds/ac with 170 lb/ac N as UAN preplant			303 a	
		Planted at 38,000 seeds/ac with 170 lb/ac N as UAN preplant plus 50 lb/ac N as UAN sidedress at V6			306 a	
170706	6	Planted at 34,000 seeds/ac			242 a	0.02
		Planted at 36,000 seeds/ac			234 b	
170812	7	Planted at 33,000 seeds/ac	31,300 a		226 a	0.39
		Planted at 36,000 seeds/ac	34,300 ab		232 a	
		Planted at 39,000 seeds/ac	36,800 b		220 a	
170823	8	Planted at 34,000 seeds/ac		32,000 a	214 a	0.07
		Planted at 38,000 seeds/ac		34,000 a	209 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 2017.

Exp. no.	Trial	Treatment	Fall stand count (plants/ac)	Yield (bu/ac)[a]	P-value (yield)[b]
170119	1	Planted 4/24/17		70 a	0.20
		Planted 5/15/17		69 a	
170127	2	Planted with 15-in. rows		62 a	0.07
		Planted with 30-in. rows		66 a	
170128	3	Planted 125,000 seeds/ac		70 a	0.30
		Planted 150,000 seeds/ac		70 a	
		Planted 175,000 seeds/ac		70 a	
170129	4	Planted 90,000 seeds/ac	86,000 a	74 a	0.04
		Planted 110,000 seeds/ac	102,000 ab	74 a	
		Planted 130,000 seeds/ac	119,000 bc	74 a	
		Planted 150,000 seeds/ac	143,000 c	76 b	
170213	5	Planted at 150,000 seeds/ac	120,900 a	59 a	0.86
		Planted at 180,000 seeds/ac	141,200 b	60 a	
170408	6	Planted at 145,000 seeds/ac		55 a	0.74
		Planted at 165,000 seeds/ac		55 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.