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. Timely planting also is important for optimum yields. The objective of these trials was to investigate the effect of various planter operations on corn and soybean yield.

Materials and Methods

In 2018, 10 trials investigated the effects of various aspects of planter operations on corn yield (Table 1), and 15 trials investigated the effects of various planter operations on soybean yield (Table 2). Most trials were conducted on-farm by farmer cooperators using the farmer's equipment. Some soybean trials investigating planting date were conducted on research farms. 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 Trials 1, 9, and 10 investigated the effect on corn yield of various planter speeds, ranging from five to eight mph (Table 3). In Trial 2, the effect of using a fixed plant population compared with a variable rate population on corn yield was investigated. Trials 3, 5, and 6 investigated the effect of two to three seeding rates on corn yield. Trial 4 investigated the effect of planter down pressure on corn yield. Trials 7 and 8 investigated the effect of planting a high population in 60-in. rows vs. a lower population in 30-in. rows.

In soybean Trials 1, 2, and 4, the effect of various seeding rates on soybean yield was investigated (Table 4). In Trial 3, soybeans planted in early May were compared with soybeans planted in late May. In Trials 5, 6, 7, 8, 9, 10, 11, and 12, soybeans planted in late April were compared with soybeans planted in late May. In Trials 13 and 15, soybeans planted in 15-in. rows were compared with soybeans planted in 30-in. rows. In Trial 14, soybean planted with planter speeds from five to 6.5 mph was investigated.

Results and Discussion

In corn Trial 1 and 10, the planter speed had no effect on corn yield with speeds up to eight mph (Table 3). However, in Trial 9, corn planted at seven mph yielded 13 bushels/acre less than corn planted at 6.5 mph ($P = 0.03$). This may have been due to less accurate seed placement at the higher speed. In Trial 2, the

corn planted with a variable rate population of 28,000–39,000 seeds/acre yielded the same as corn planted at 34,000 seeds/acre. In Trial 3, seeding rates from 32,000–38,000 seed/acre had no effect on corn yield. In Trial 5, corn seeded at 32,000 seeds/acre yielded less than corn planted at 28,000 or 36,000 seeds/acre. In Trial 6, corn planted at 26,000 seeds/acre yielded the same as corn planted at 32,000 seeds/acre, but yields were very low in this trial due to wind damage. Based on these trials, it is apparent that seeding rates of 32,000 seeds/acre or less may be adequate for maximum corn yields. Thus, there may be opportunities for some farmers to reduce seeding rates, although results likely will vary from year to year.

In Trial 4, corn planted using down pressures from 100–350 pounds/square inch yielded the same. In Trials 7 and 8, corn planted in 60-in. rows at 53,500 seeds/acre yielded 9–15 bushels/acre less than corn planted in 30-in. rows at 35,600 seeds/acre ($P \leq 0.03$). There has been some interest in interseeding a cover crop into standing corn planted in 60-in. rows, but these studies indicate there will likely be a yield penalty with that practice.

In soybean Trials 1, 2, and 4, there was no effect of seeding rates from 100,000–160,000 seeds/acre on soybean yield (Table 4). Past studies have indicated soybean yields are similar with a wide range of 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. In Trial 3, soybeans planted in early May yielded seven bushels/acre more than soybeans planted in late May ($P < 0.01$). In Trials 5, 6, 7, 8, 9, 10, 11, and 12, soybean yields tended to be lower with the late May seeding date versus the late April seeding date, but it was only significantly lower with the late May seeding date in Trials 9, 10, and 11 ($P \leq 0.05$). Past studies have shown soybean yields are usually the highest if seeded by early May.

In Trial 13, soybeans planted in 30-in. rows yielded two bushels/acre more than soybeans planted in 15-in. rows ($P = 0.05$). In Trial 15, there was no difference in yield between soybeans planted in 15-in. rows and soybeans planted in 30-in. rows. 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. However, there was little disease present in Trial 13, so it is unknown why the yield was lower with the 15-in. rows. In Trial 14, soybeans planted at 6.5 mph yielded 10 bushels/acre less than soybeans planted at 6.0 mph ($P < 0.01$). This may indicate more accurate seed placement with the lower planting speed.

Table 1. Variety, row spacing, planting date, planting population, previous crop, and tillage practice in the 2018 planter trials on corn.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
180103	1	Lynn	Pioneer PO157AMX	22	5/7/18	36,000	Corn	Conventional
180104	2	Lynn	Pioneer P9929	22	5/18/18	34,000, VR	Corn	Conventional
180118	3	Osceola	Dekalb DKC47-47	30	5/22/18	32,000, 35,000, 38,000	Soybean	Conventional
180126	4	Sioux	Pioneer PM306AM	30	5/10/18	34,000	Oats	Conventional
180302	5	Monona	LG 5643	30	5/30/18	28,000, 32,000, 36,000	Soybean	No-till
180603	6	Cass	Epplys 14C5	30	5/20/18	26,000, 32,000	Soybean	No-till
180207	7	Buena Vista	Golden Harvest GO2W74	30 & 60	5/18/18	35,600, 43,500	Soybean	Spring field mulch, harrow
180211	8	Buena Vista	Golden Harvest GO2W74	30 & 60	5/18/18	35,600, 43,500	Soybean	Spring field mulch, harrow
180805	9	Howard	Pioneer P9929 AMXT	30	5/17/18	36,000	Corn	No-till
180818	10	Mitchell	Pioneer P9929 AMXT	30	5/18/18	36,000	Corn	No-till

Table 2. Variety, row spacing, planting date, planting population, previous crop, and tillage practices in the 2018 planter trials on soybean.

Exp. no.	Trial	County	Variety	Row spacing (in.)	Planting date	Planting population (seeds/ac)	Previous crop	Tillage
180106	1	Lyon	Stine 14RD62	22	5/19/18	100,000, 130,000	Corn	No-till
180125	2	Sioux	Pioneer P22T24X	30	5/19/18	130,000, 150,000	Soybean	No-till
180128	3	Sioux	Pioneer P24A99X	30	5/7/18, 5/24/18	140,000	Corn	No-till
180301	4	Monona	LG 2899LL	30	6/17/18	120,000, 140,000, 160,000	Corn	No-till
180608	5	Adair	Pioneer P31A22X	30	4/30/18, 5/30/18	140,000	Corn	No-till
180609	6	Adair	Pioneer P25T51R	30	4/30/18, 5/30/18	140,000	Corn	No-till
180610	7	Adair	Pioneer P27T59R	30	4/30/18, 5/30/18	140,000	Corn	No-till
180611	8	Adair	Pioneer P22T73R	30	4/30/18, 5/30/18	140,000	Corn	No-till
180613	9	Pottawattamie	Pioneer P31A22X	30	4/30/18, 5/30/18	140,000	Corn	No-till
180614	10	Pottawattamie	Pioneer P25T51R	30	4/30/18, 5/30/18	140,000	Corn	No-till
180619	11	Pottawattamie	Pioneer P27T59R	30	4/30/18, 5/30/18	140,000	Corn	No-till
180620	12	Pottawattamie	Pioneer P22T73R	30	4/30/18, 5/30/18	140,000	Corn	No-till
180703	13	Linn	FS Hisoy S28L70	15 & 30	5/17/18	140,000	Corn	No-till
180822	14	Howard	NK20T6	30	5/17/18	155,000	Corn	No-till
180823	15	Bremer	Channel Bio CB2416R2XTD	15 & 30	5/24/18	142,000	Corn	No-till

Table 3. Yields for on-farm corn planter trials in 2018.

Exp. no.	Trial	Treatment	Stand count (plants/ac)[a]	Yield (bu/ac)[a]	P-value (yield)[b]
180103	1	Planted at 6 mph		199 a	0.20
		Planted at 7 mph		228 a	
		Planted at 8 mph		196 a	
180104	2	Planted at 34,000 seeds/ac		209 a	0.39
		Planted at variable rate 28,000 to 39,000 seeds/ac		213 a	
180118	3	Planted at 32,000 seeds/ac		213 a	0.57
		Planted at 35,000 seeds/ac		213 a	
		Planted at 38,000 seeds/ac		215 a	
180126	4	Planted with 100 lb of down pressure		232 a	0.88
		Planted with 225 lb of down pressure		232 a	
		Planted with 350 lb of down pressure		231 a	
180302	5	Planted at 28,000 seeds/ac	28,000 a	195 a	<0.01
		Planted at 32,000 seeds/ac	32,300 b	177 b	
		Planted at 36,000 seeds/ac	35,300 c	188 a	
180603	6	Planted at 26,000 seeds/ac	21,700 a	102 a	0.47
		Planted at 32,000 seeds/ac	26,700 b	100 a	
180207	7	Planted in 30-in. rows at 35,600 seeds/ac	32,500 a	229 a	0.03
		Planted in 60-in. rows at 53,500 seeds/ac	41,400 b	214 b	
180211	8	Planted in 30-in. rows at 35,600 seeds/ac	32,500 a	230 a	<0.01
		Planted in 60-in. rows at 53,500 seeds/ac	41,300 b	221 b	
180805	9	Planted at 5 mph		189 a	0.03
		Planted at 5.5 mph		182 ab	
		Planted at 6 mph		185 ab	
		Planted at 6.5 mph		189 a	
		Planted at 7 mph		176 b	
180818	10	Planted at 5 mph		227 a	0.18
		Planted at 5.5 mph		227 a	
		Planted at 6 mph		220 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 2018.

Exp. no.	Trial	Treatment	Fall stand count (plants/ac)[a]	Yield (bu/ac)[a]	P-value (yield)[b]
180106	1	Planted at 100,000 seeds/ac		78 a	0.10
		Planted at 130,000 seeds/ac		80 a	
180125	2	Planted at 90,000 seeds/ac		66 a	0.06
		Planted at 110,000 seeds/ac		67 a	
		Planted at 130,000 seeds/ac		66 a	
		Planted at 150,000 seeds/ac		67 a	
180128	3	Planted on 5/7/18		81 a	<0.01
		Planted on 5/24/18		74 b	
180301	4	Planted at 120,000 seeds/ac	114,000 a	55 a	0.10
		Planted at 140,000 seeds/ac	134,000 b	48 a	
		Planted at 160,000 seeds/ac	150,000 c	52 a	
180608	5	Planted on 4/30/18		57 a	0.12
		Planted on 5/30/18		48 a	
180609	6	Planted on 4/30/18		45 a	0.90
		Planted on 5/30/18		46 a	
180610	7	Planted on 4/30/18		49 a	0.11
		Planted on 5/30/18		37 a	
180611	8	Planted on 4/30/18		36 a	0.76
		Planted on 5/30/18		37 a	
180613	9	Planted on 4/30/18		53 a	<0.01
		Planted on 5/30/18		37 b	
180614	10	Planted on 4/30/18		43 a	0.05
		Planted on 5/30/18		34 b	
180619	11	Planted on 4/30/18		53 a	<0.01
		Planted on 5/30/18		43 b	
180620	12	Planted on 4/30/18		42 a	0.86
		Planted on 5/30/18		41 a	
180703	13	Planted in 15-in. rows		72 a	0.05
		Planted in 30-in. rows		74 b	
180822	14	Planted at 5 mph		57 ab	<0.01
		Planted at 5.5 mph		56 ab	
		Planted at 6 mph		62 a	
		Planted at 6.5 mph		52 b	
180823	15	Planted in 15-in. rows		47 a	0.25
		Planted in 30-in. rows		48 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.