Data-Intensive Farm Management: Soybean Seeding Rate

Study ID: 0709047201901
County: Dawson
Soil Type: Cozad silt loam, 0-1% slope; Cozad silt loam, 1-3% slope; Hall silt loam, 0-1% slope; Hord silt loam, 0-1% slope
Planting Date: 6/6/19
Harvest Date: 10/15/19
Row Spacing (in): 30
Variety: Channel® 2519R2X
Reps: 6
Previous Crop: Corn
Tillage: No-Till
Herbicides: *Pre:* 24 oz/ac Mad Dog® 5.4#, 2.8 oz/ac Valor®, and 12.8 oz/ac Engenia® on 6/6/19
Post: 24 oz/ac Mad Dog® 5.4#, 5 oz/ac Assure® II, and 48 oz/ac Warrant®
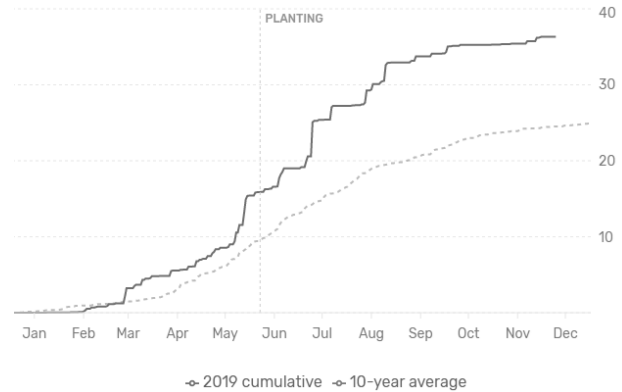**Seed Treatment:** NemaStrike™, Optimize®, Acceleron® Elite

Foliar Insecticides: None
Foliar Fungicides: None
Fertilizer: 100 lb/ac 21-0-0-24S, and 100 lb/ac 0-0-60 both dry spread on 5/20/19
Irrigation: Pivot, Total: 0.25" (post-planting)
Rainfall (in):

-o- 2019 cumulative   -o- 10-year average

Soil Tests (December 2018):

Soil pH 1:1	Soluble Salts 1:1 mmho/cm	Organic Matter LOI %	Nitrate surface lb N/A	Nitrate deep lb N/ac	Mehlich P-III ppm P	CaPO₄ SO₄-S ppm	Ammonium Acetate (ppm)				Sum of Cations me/100g	Zn (ppm)
							K	Ca	Mg	Na		
6.5	0.3	2.8	12	34	54	3	331	2689	448	51	18	1.6
6.8	0.3	3.1	12	42	49	9	548	2666	660	112	21	2.1
6.5	0.4	3.0	26	50	57	5	391	3118	481	49	21	2.0
6.2	0.4	3.4	31	-	40	7	389	3136	455	41	21	1.9
7.2	0.6	2.7	31	-	43	11	428	2738	468	54	19	2.3
6.8	0.3	2.8	22	-	44	4	326	2643	386	41	17	3.0

Introduction: This study is part of the Data-Intensive Farm Management Project, a multi-university collaboration led by the University of Illinois at Urbana-Champaign. The goal of these research studies is to utilize precision agriculture technology for conducting on-farm research. This study tested four soybean planting rates: 80,000 seeds/ac, 110,000 seeds/ac, 140,000 seeds/ac, and 170,000 seeds/ac. Treatments were randomized and replicated in 90' wide by 300' long blocks across the field (Figure 1). At this site, 12 replications were planned; however, only 6 replications were planted due to monitor errors and wet areas that remained unplanted (Figure 1). Variable-rate prescription maps for the study were developed and uploaded to the in-cab monitor. The planter utilized airbag downforce pressure on row units and row cleaners. Soybean rows were planted between the previous year's corn rows. Flooding and heavy rain in early July resulted in large variations in plant conditions with no obvious pattern. Geospatial yield monitor data were collected at the end of the growing season and post-processed to remove errors with Yield Editor software from the USDA. The as-planted data were evaluated, and only areas that achieved planting rates within 10% of the target seeding rate were included for yield analysis. Stand counts were taken on June 27 in 12 replications; these stand counts were used to
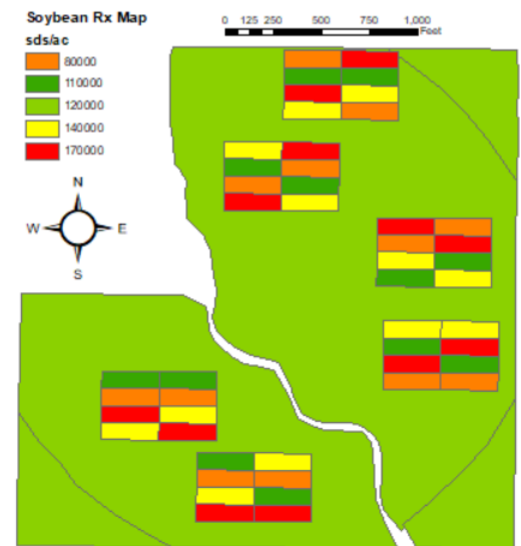

Figure 1. Soybean seeding rate prescription map for 2019 field site.

determine percent emergence. There was interest in determining if soybean stem diameter was related to planting rate and if stem diameter was related to infestations of Dectes stem borer. In field measurements were made to determine stem diameter and Dectes stem borer infestation on August 1 in 12 replications.

Results:

Planting rate (seeds/ac)	Stand Count (plants/ac)	Emergence (%)	Stem Diameter (mm)	Dectes Stem Borer Infestation %	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ ($/ac)
80,000	65,833 C*	82 A	9 A	7 A	10.5 A	73 A	552.69 A
110,000	83,833 B	76 A	8 A	8 A	10.5 A	76 A	567.99 A
140,000	104,000 A	74 A	8 A	5 A	10.6 A	78 A	570.08 A
170,000	118,833 A	70 A	8 A	7 A	10.6 A	75 A	532.34 A
P-Value	<0.0001	0.276	0.135	0.930	0.242	0.344	0.374

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre adjusted to 13% moisture.
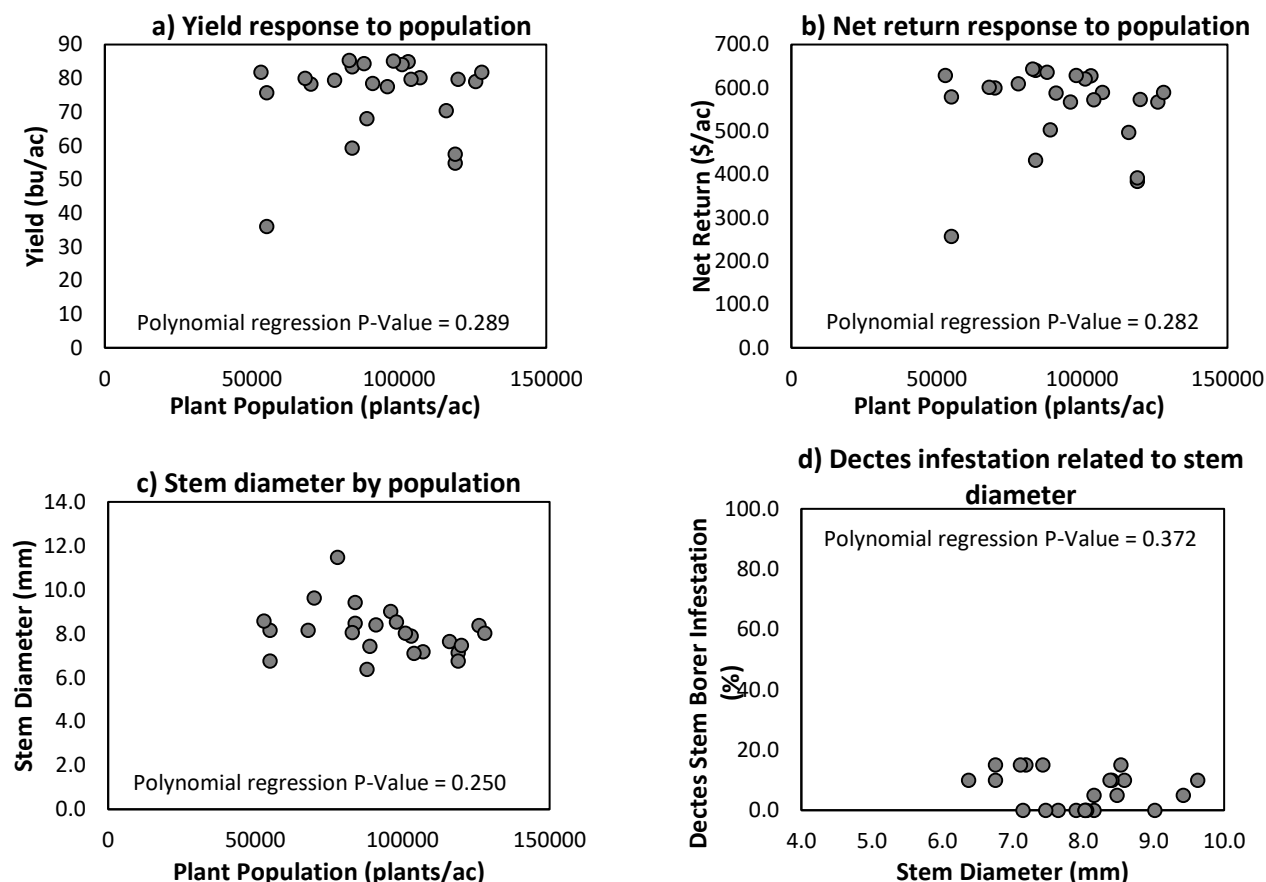‡Marginal net return based on $8.10/bu soybean and $60/unit of 140,000 seeds.

Figure 2. a) Yield response to plant population (determined by stand count), **b)** net return response to population (determined by stand counts), **c)** stem diameter by plant population (determined by stand counts), and **d)** Dectes

stem borer infestation as related to stem diameter. Regression lines were fit and displayed if the relationship was statistically significant.

Summary:
- Plant stands ranged from 70% to 82% of the seeding rate.
- Stem diameter and Dectes stem borer infestation were not impacted by seeding rate or plant population at this site. Dectes stem borer infestation was relatively low, ranging from 5% to 7%.
- Yield and net return were not significantly different for the planting rates evaluated. The lowest seeding rate of 80,000 seeds/ac with plant stands averaging 66,000 plants/ac achieved yields as high as the 170,000 seeds/ac treatment with plant stands averaging 119,000 plants/ac.