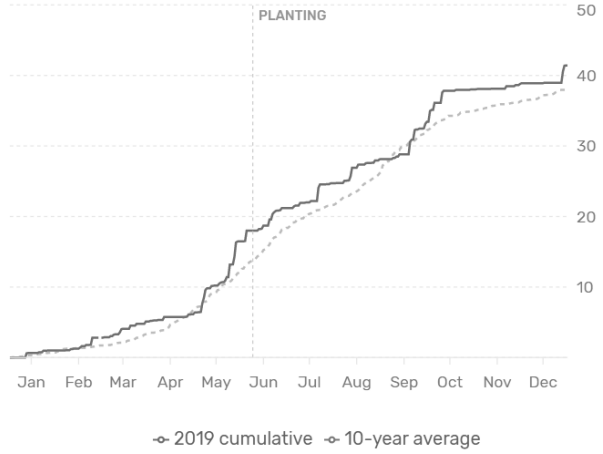
Data-Intensive Farm Management: Soybean Seeding Rate

Study ID: 0816025201902
County: Cass
Soil Type: Judson silt loam 2-6% slopes; Wymore silty clay loam 3-6% slopes, eroded; Wymore silty clay loam 0-2% slope; Wymore silty clay loam 2-6% slopes
Planting Date: 6/8/19
Harvest Date: 10/15/19
Row Spacing (in): 30
Variety: LG Seeds® C3550RX
Reps: 10
Previous Crop: Corn (averaged >200 bu/ac)
Tillage: No-Till
Herbicides: ***Pre:*** 25 oz/ac BroadAxe®, 3 oz/ac Dimetric® EXT, 32 oz/ac Durango® DMA®, and 16 oz/ac 2,4-D ***Post:*** 6 oz/ac Cleanse® 2 EC, 3.5 pt/ac Flexstar® GT, and 2.5 pt/ac Sequence® with 4 oz/ac InterLock®

Seed Treatment: ApronMaXX® with Vibrance®
Irrigation: None
Rainfall (in):



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, there were 10 replications. Variable-rate prescription maps for the study were developed and uploaded to the in-cab monitor. Air downforce was used on the planter; row cleaners were not engaged. Soybean rows were planted between the previous year's corn rows. 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.

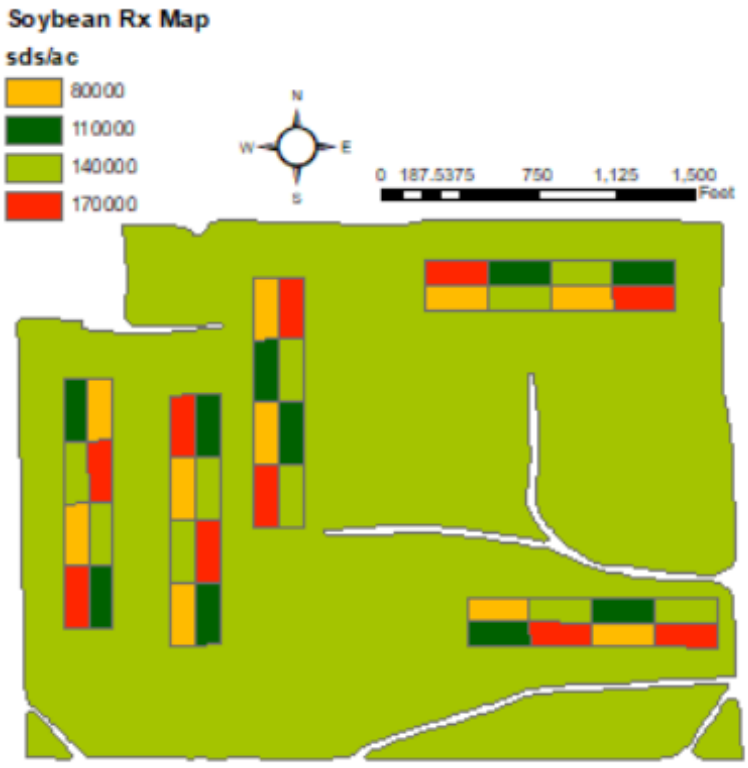


Figure 1. Soybean seeding rate prescription map for 2019 field site.

Stand counts were taken on June 25 for all 10 replications; these stand counts were used to 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 October 15 for four of the 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	60,600 D*	76 A	8 A	0 A	11.4 A	59 A	444.58 A
110,000	78,600 C	72 AB	7 B	1 A	11.2 AB	60 A	434.69 AB
140,000	98,800 B	71 AB	6 B	0 A	11.0 B	60 A	426.43 AB
170,000	110,600 A	65 B	6 C	1 A	11.0 B	60 A	413.75 B
P-Value	<0.0001	0.037	<0.0001	0.618	0.001	0.795	0.016

*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.

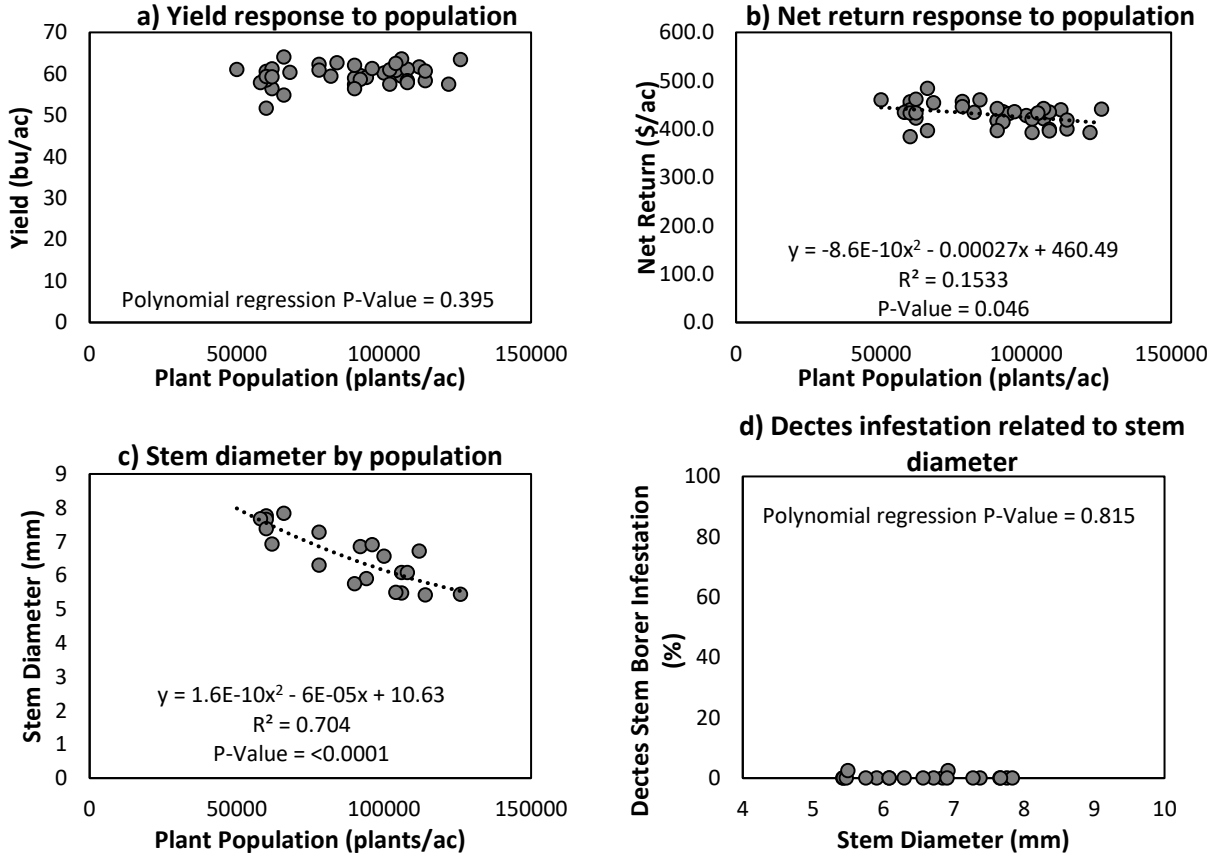


Figure 2. a) Yield response to plant population (determined by stand count), **b)** net return response to population (determined by stand counts), **c)** stem diameter by plant population (determined by stand counts), and **d)** Dectes stem borer infestation as related to stem diameter. Regression lines were fit and displayed if the relationship was statistically significant.

Summary:

- Plant stands ranged from 65% to 76% of the seeding rate.
- Stem diameter was larger for lower planting rates. Stem diameter was not related to Dectes stem borer infestation, which was very low at this site regardless of seeding rate.
- There were no yield differences among the four seeding rates evaluated. There was no significant linear or polynomial relationship between plant population and yield (Figure 2).
- Marginal net return was significantly related to the plant population (Figure 3). The highest marginal net return was obtained at the lowest seeding rate evaluated (80,000 seeds/ac).

This research was supported in part by an award from the USDA NIFA Agriculture and Food Research Initiative's Food Security Challenge Area program, award number 2016 – 68004 – 24769.