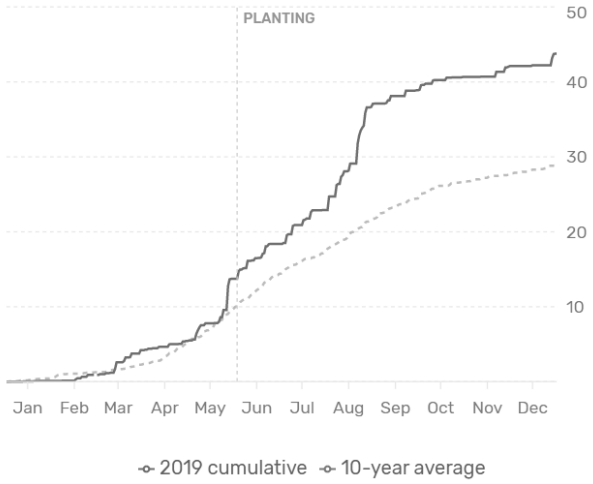
Data-Intensive Farm Management: Soybean Seeding Rate

Study ID: 0073081201901
County: Hamilton
Soil Type: Hastings silt loam 0-1% slope; Crete silt loam 0-1% slope; Hastings silty clay loam 7-11% slopes, eroded; Uly silt loam 11-30% slopes, eroded; Butler silt loam 0-1% slope
Planting Date: 6/2/19
Harvest Date: 10/23/19
Row Spacing (in): 30
Variety: Pioneer® P28A74PR
Reps: 6
Previous Crop: Corn
Tillage: Strip-Till
Herbicides: ***Pre:*** 24 oz/ac glyphosate 53.8%, 7 oz/ac Verdict®, and 1 pt/ac Metalica with 0.5 pt/ac MSO XTRA on 6/2/19 ***Post:*** 28 oz/ac glyphosate 53.8% with 2.67 oz/ac FBN™ AMS Pro on 6/20/19; 24 oz/ac Buccaneer Plus® with 1 qt/ac FBN™ AMS pro on 7/28/19

Fertilizer: 95 lb/ac 11-52-0 on 5/17/19
Note: 1 pt/ac Conklin® Syntose FA® added with 6/20/19 herbicide application
Irrigation: Pivot, Total: 0”
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 80' wide by 300' long blocks across the field (Figure 1). Variable-rate prescription maps for the study were developed and uploaded to the in-cab monitor. The planter utilized air bag downforce on the row units; row cleaners were not engaged during planting. There was an oat cover crop located from the south border of the field to approximately 250-feet north of the pivot point; the cover crop did not appear to consistently affect yield or emergence. 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; 6 of the 15 originally planned blocks shown in Figure 1 were used in the yield analysis.

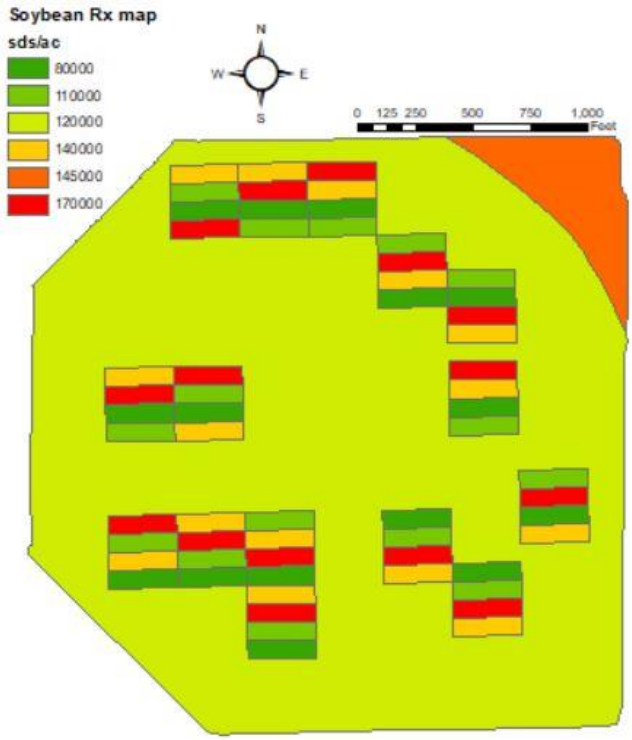


Figure 1. Soybean seeding rate prescription map for 2019 field site.

Stand counts were taken on June 19 for all six 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 7 for two replications. Since Dectes stem borer infestation and stem diameter were only measured on two of the six replications, no statistical analyses are provided; averages are reported.

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	49,000 C*	61 A	10	0	11.4 A	57 B	430 A
110,000	73,000 BC	66 A	7	3	11.4 A	63 A	460 A
140,000	83,333 B	60 A	7	6	11.4 A	64 A	456 A
170,000	115,667 A	68 A	8	3	11.5 A	64 A	445 A
P-Value	0.0002	0.747	-	-	0.881	0.006	0.202

*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.

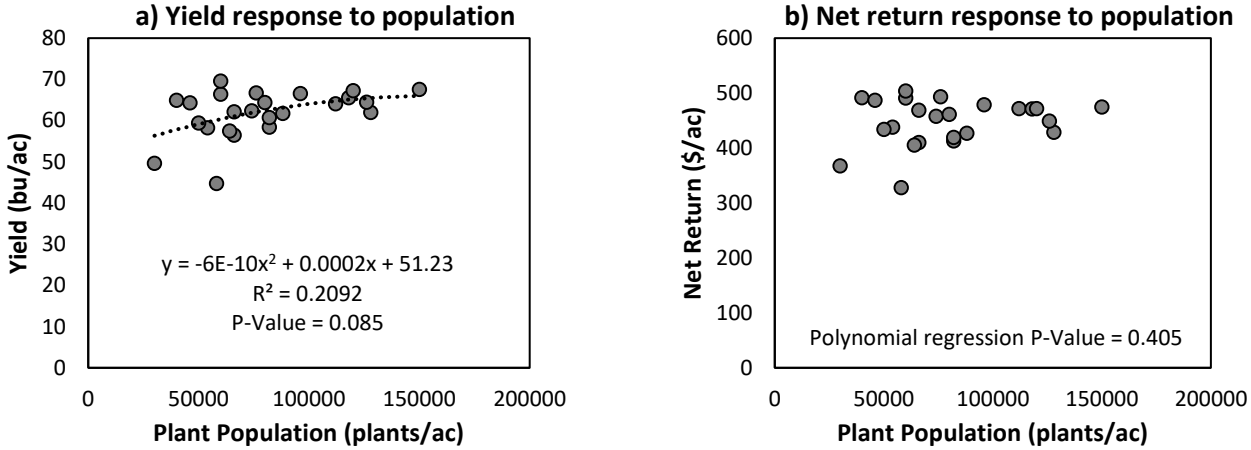


Figure 2. a) Yield response to plant population and **b)** net return response to population. Plant populations were determined by stand counts. Regression lines were fit and displayed if the relationship was statistically significant.

Summary:

- Plant populations at this site were notably lower than target seeding rates ranging from 60% to 68% of the seeding rate.
- Dectes stem borer counts were low at this site with treatment averages ranging from 0% to 6% of plants infested.
- Yield was lower for the 80,000 seeds/ac treatment, which had stands of 49,000 plants/ac. There was no yield difference for the 110,000 through 170,000 seeds/ac treatments, which had stands ranging from 73,000 to 116,000 plants/ac. Economically optimum yield at a price of $8.10/bu soybeans and $60/140,000 seeds was obtained at 113,000 plants/ac.

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