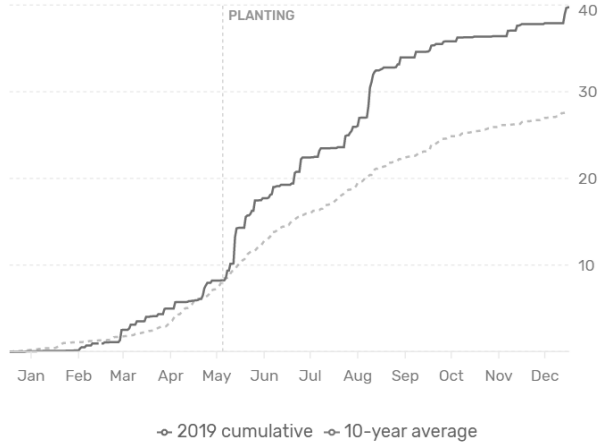
Data-Intensive Farm Management: Soybean Seeding Rate

Study ID: 0831001201901
County: Adams
Soil Type: Hastings silt loam 0-1% slope; Crete silt loam 0-1% slope
Planting Date: 5/19/19
Harvest Date: 9/25/19
Variety: Pioneer® P24A99X
Row Spacing (in): 30
Reps: 3
Previous Crop: Seed Corn
Tillage: Row stalker before planting; cultivated and hilled
Herbicides: ***Pre:*** 6 oz/ac Zidua® PRO, 16 oz/ac 2,4-D LV, and 32 oz/ac glyphosate on 4/24/19 ***Post:*** 12.8 oz/ac Engenia®, 12 oz/ac clethodim, 32 oz/ac glyphosate, and 2 qt/ac Warrant® on 6/24/19

Seed Treatment: EverGol® Energy, Allegiance®, Gaucho®, Pioneer Premium Seed Treatment (PPST) 120+
Foliar Insecticides and Fungicides: None
Fertilizer: None
Irrigation: subsurface drip irrigation
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 field length strips; at this site, there were 3 replications. Variable-rate prescription maps for the study were developed and uploaded to the in-cab monitor. The planter utilized Precision Planting® row sweeps and Martin-Till® row cleaners with air downforce on row units. 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 rates were included for yield analysis.

Stand counts were taken on June 26; these stand counts were used to determine percent emergence. There was interest in determining if larger soybean stem diameters would lead to lower Dectes stem borer

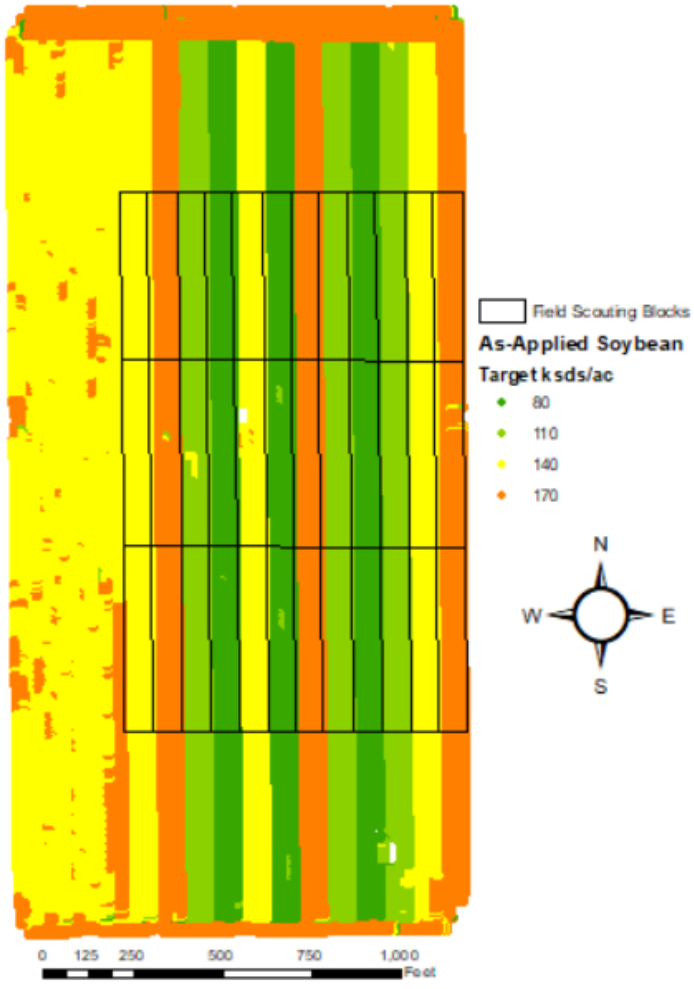


Figure 1. Field length strip target rates (manually entered by operators) with corresponding blocks used for field scouting (emergence and pest observations).

infestations. In field measurements were made to determine stem diameter and Dectes stem borer infestation on September 25 for all three replications in three locations within the length of each treatment strip. Hail and wind damage occurred during early pod fill and over 30" of rain was received during the growing season.

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	70,445 D*	88 A	9 A	21 A	12.8 A	52 A	385.60 A
110,000	96,000 C	87 A	7 AB	11 BC	11.8 A	49 A	349.80 A
140,000	126,445 B	90 A	6 B	14 B	11.9 A	50 A	346.94 A
170,000	151,556 A	89 A	6 B	8 C	12.8 A	54 A	360.41 A
P-Value	<0.0001	0.775	0.049	0.0001	0.792	0.697	0.619

*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.

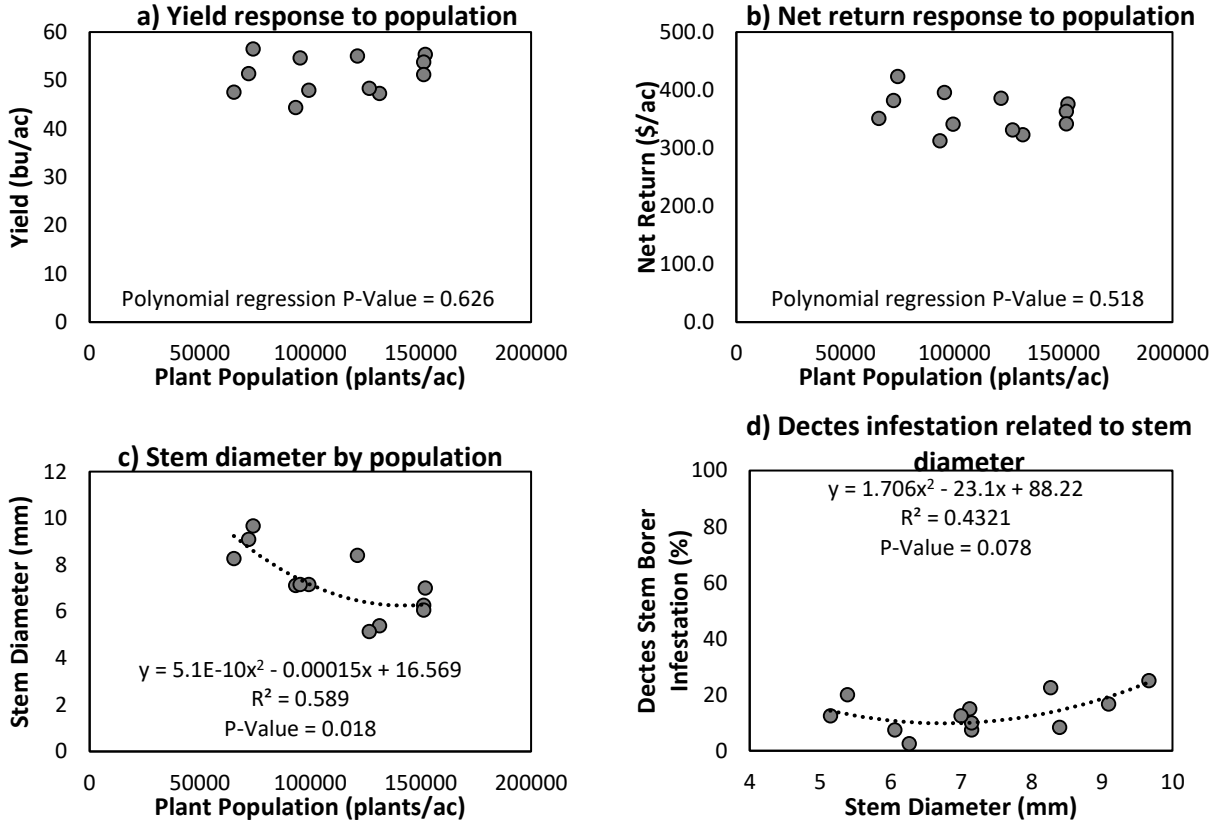


Figure 2. a) Yield response to plant population (determined by stand count), **b)** net return response to population (determined by stand counts), **c)** stem diameter by plant population (determined by stand counts), and **d)** Dectes stem borer infestation as related to stem diameter. Regression lines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

Summary:

- Plant populations at this site ranged from 87% to 90% of the target seeding rate.
- Stem diameter was related to seeding rate and plant population, with lower seeding rates having larger stem diameters.
- Dectes stem borer counts at this site ranged from 8% to 22% of plants infested. Dectes stem borer infestation was related to stem diameter and seeding rate, with larger stem diameters and lower seeding rates having a higher infestation.
- Yield and net return was not different among the four seeding rates evaluated.

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.