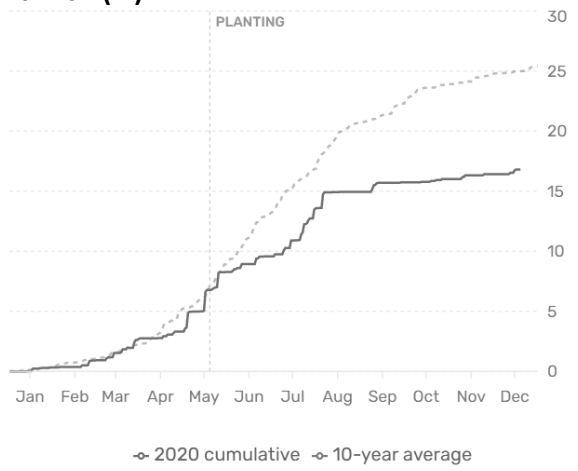
Organic Soybean Planting Population

Study ID: 0641047202001
County: Dawson
Soil Type: Cozad silt loam; Cozad silty clay loam; Hord silt loam; Hord silty clay loam
Planting Date: 5/19/20
Harvest Date: 10/2/20
Row Spacing (in): 36
Hybrid: 291GHXG
Reps: 5
Previous Crop: Corn
Tillage: Full Tillage, Chisel 3/15/17
Herbicides: ***Pre:*** None ***Post:*** None
Seed Treatment: None
Foliar Insecticides: None
Foliar Fungicides: None
Fertilizer: None
Soil Tests:

Irrigation: Pivot, Total: 7.2”
Rainfall (in):



Soil pH 1:1	Soluble Salts 1:1 mmho/cm	OM LOI-%	KCl Nitrate ppm N	Nitrate Lbs N/ac	P ppm	-Ammonium Acetate- K ppm	Ca ppm	Mg ppm	NA ppm	M-3 Sulfate ppm S	----------DTPA---------- Zn ppm	Fe ppm	Mn ppm	Cu ppm	Hot Water Boron ppm	Sum of Cations Me/100g	% Base ---Saturation--- H	K	Ca	Mg	Na
7.6	0.31	2.6	2.4	6	32	571	2194	726	262	51.4	1.27	34.5	5.7	1.01	1.08	19.6	0	7	56	31	6
7.3	0.40	2.6	1.6	4	44	602	2115	787	265	84.8	1.29	34.9	7.5	1.21	1.32	19.8	0	8	53	33	6
7.3	0.15	2.1	3.6	9	20	326	2059	324	38	10.1	.60	12.6	5.8	.45	.39	14	0	6	74	19	1
7.3	.21	3.0	3.8	9	21	403	3293	452	58	17.5	.95	26.4	6.9	.80	.46	21.5	0	5	76	18	1
6.8	.20	2.4	2.4	6	15	310	1957	335	42	8.3	.69	24.1	9.3	.59	.50	13.6	0	6	72	21	1
7.3	.18	2.0	.3	1	18	322	2029	324	34	8.9	.76	12.7	6.2	.47	.38	13.8	0	6	73	20	1

Introduction: Previous on-farm research has demonstrated that soybean planting rates of 80,000 to 120,000 seeds/ac were sufficient to optimize yield and could result in higher profitability. The objective of this study was to evaluate the impact of soybean planting population on canopy closure, weed cover, and yield for irrigated organic soybean production. Three soybean seeding rates were evaluated: 135,000 seeds/ac, 160,000 seeds/ac, and 185,000 seeds/ac. Canopy closure is beneficial in reducing weed pressure, particularly in organic systems; therefore, canopy closure and weed pressure were evaluated throughout the growing season to determine how they were impacted by seeding rate. Canopy closure was evaluated using the Canopeo app (Patrignani and Ochsner, 2015). Photos were taken directly over the top of the center two rows of each treatments in three locations. The percent of the image with green cover is reported for each date (Figure 1). Weed pressure was also evaluated with the assistance of the Canopeo app and visual assessment. A 1 m^2 quadrant was flagged and the Canopeo app was used to take a picture of the entire quadrant and determine percent green matter. A visual evaluation was then performed to determine how much of the percent green matter recorded by the Canopeo app was actually weeds. Percent weed cover is reported in Figure 2. Plant stand, yield, and net return were also measured.

Results:

	Early Season Stand Count (plants/ac)	Harvest Stand Count (plants/ac)	Lodging (%)	Pods/ plant	Moisture (%)	Yield (bu/ac)†	Marginal Net Return‡ ($/ac)
135,000 seeds/ac	106,667 C*	101,533 B	1 A	58 A	7.7 A	75 A	646.07 A
160,000 seeds/ac	129,067 B	114,867 A	2 A	49 A	7.9 A	73 A	621.34 B
185,000 seeds/ac	142,800 A	116,000 A	3 A	44 A	7.6 A	75 A	629.62 AB
P-Value	0.001	0.014	0.423	0.179	0.201	0.137	0.063

*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 corrected to 13% moisture.
‡Marginal net return based on $9.50/bu soybean and $64.90/unit of 140,000 seeds.

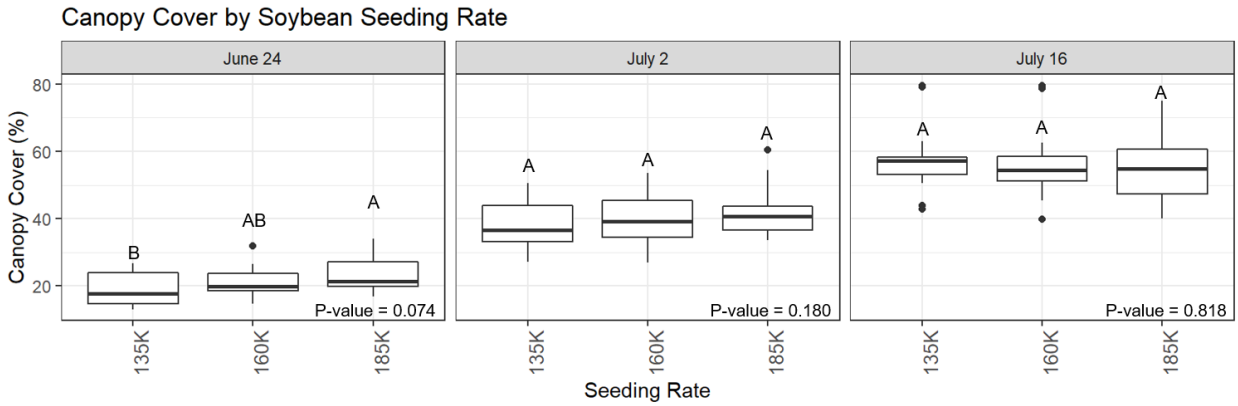


Figure 1. Percent green cover measured with the Canopeo app at three dates for the 135,000, 160,000, and 185,000 seeds/ac soybean planting populations to determine canopy cover.

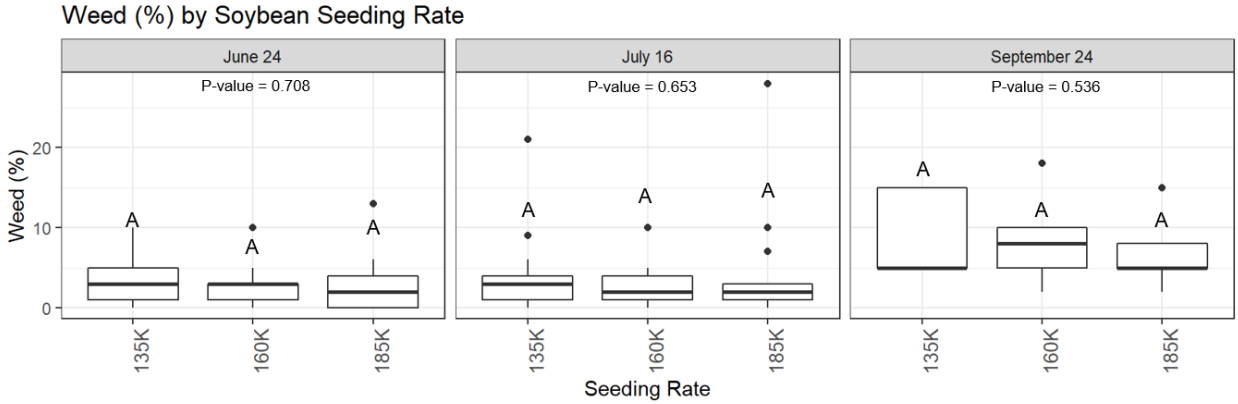


Figure 2. For each seeding rate, the percent of green matter in a 1 m^2 quadrat was recorded using the Canopeo app. Visual assessment was used to determine the percent of green matter in the quadrant that represented weeds.

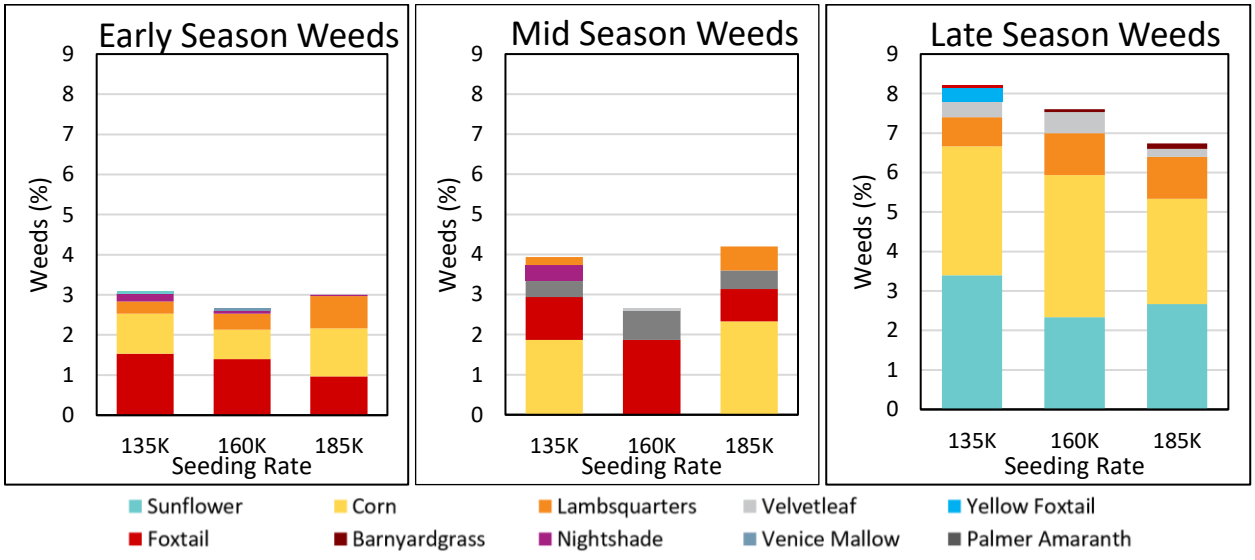


Figure 3. Weeds present for each seeding rate during early, mid, and late season for volunteer corn (*Zea mays*), Palmer Amaranth (*Amaranthus palmeri*), Foxtail species (*Setaria spp.*), Common Lambsquarter (*Chenopodium album*), Common Sunflower (*Helianthus annus*), Venice Mallow (*Hibiscus trionum*), Barnyardgrass (*Echinochloa crusgalli*), Eastern Black Nightshade (*Solanum ptycanthum*), and Velvetleaf (*Abutilon theophrasti*).

	Canopy Closure (% green cover)			Weed Pressure (% of green cover that is weeds)		
	June 24	July 2	July 16	June 24	July 16	September 24
135,000 seeds/ac	19 B	39 A	58 A	3 A	4 A	8 A
160,000 seeds/ac	21 AB	40 A	56 A	3 A	3 A	8 A
185,000 seeds/ac	24 A	42 A	56 A	3 A	4 A	7 A
P-Value	0.074	0.180	0.818	0.708	0.653	0.536

Summary:

- On June 24, the 135,000 seeds/ac treatment had lower percent canopy cover than the 185,000 seeds/ac; however, on July 2 and July 16, there was no difference in canopy cover between the three seeding rates.
- Percent weed cover was not different between the treatments. Total weed pressure increased as the season progressed, with more weed pressure on September 24 than June 24 or July 16. Weed species on June 24 and July 16 were primarily corn and foxtail. On September 24, weed species were primarily sunflower and corn.
- There was no difference in lodging, pods per plant, or soybean grain moisture between the three seeding rates.
- Yield was not different among the seeding rates evaluated. The 135,000 seeds/ac treatment resulted in higher marginal net return than the 160,000 seeds/ac treatment.

Patrignani, A. and Ochsner, T.E., 2015. Canopeo: A powerful new tool for measuring fractional green canopy cover. Agronomy Journal, 107(6), pp.2312-2320.

Sponsored by: University of Nebraska Lincoln

In Partnership with: Nebraska Corn Board, Nebraska Soybean Checkoff, Nebraska Corn Growers Association, Nebraska Dry Bean Commission