

Effects of Planting Population on Yield in Full Season Soybeans

Final Report to the Maryland Soybean Board

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Introduction

Soybean population plots were planted on four University Research and Education Centers (REC) and on one farm in Carroll County. Planted populations were 80, 100, 120, 140, and 160 thousand plants per acre. At the Wye REC, an additional population of 50 thousand plants per acre was added. Table 1 provides planting, data collection, and harvesting information for each site.

Table 1. Site locations for 2020 Soybean Population Research Project.

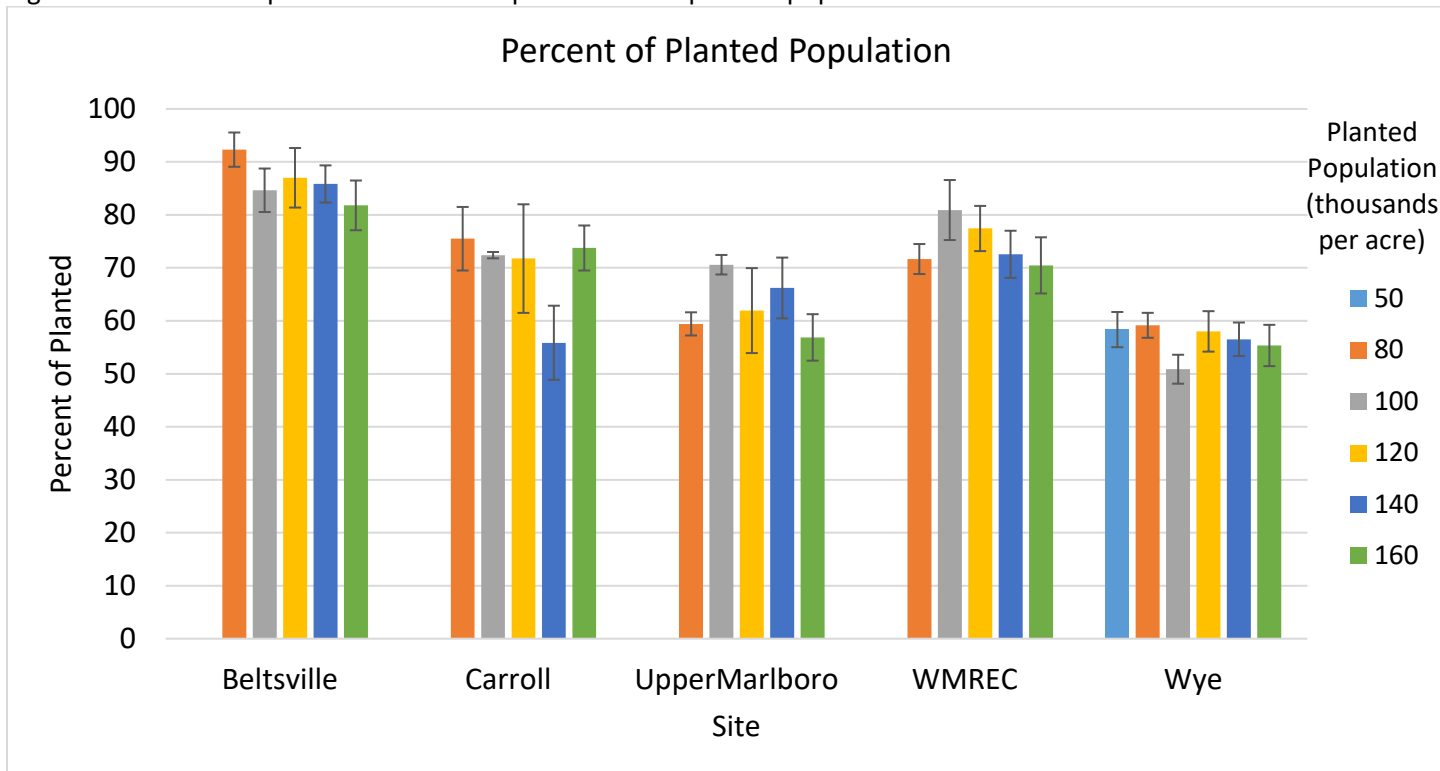
Location	Planting Date	Row Spacing	Final Stand Count Date	Harvest Date	Number of Replications
Beltsville REC	May 29	15 inches	October 9	November 10	4
Carroll County Farm	May 14	7.5 inches	September 22	September 23	2
Upper Marlboro REC	April 22	20 inches	September 14	October 8	4
Western Maryland REC (WMREC, Keedysville)	May 5	30 inches	October 21	November 18	4
Wye REC (Queenstown)	May 20	15 inches	October 15	November 20	4

Results

Final Stand Count

Stand counts were taken prior to harvest; this number of plants present in the field at harvest time was converted to a percent of the planted population. The average percent of planted plants at harvest across all populations was 56% (Wye), 63% (Upper Marlboro), 70% (Carroll), 75% (WMREC), and 86% (Beltsville). Some of these numbers were a bit lower than expected, and most likely due to wet spots, weeds, and variety performance. Even though some sites had a low survival rate, this did not correlate to a lower yield. Within each site, stand counts were fairly consistent across the planted populations (Figure 1). Planted population was not significant; one population did not lose more plants compared to another planted population.

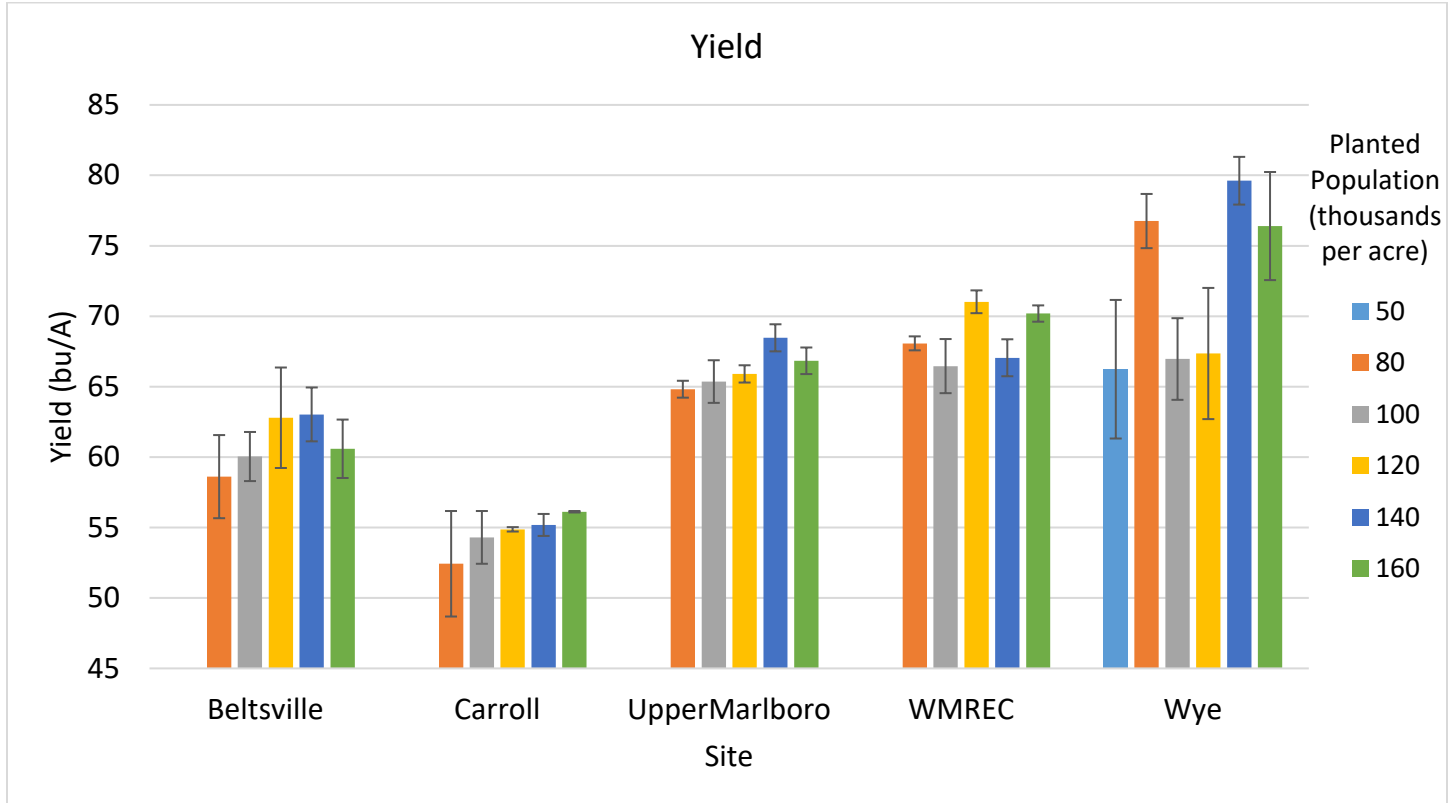
Figure 1. Stand count prior to harvest as a percent of the planted population.



Yield

The following yield ranges were seen at each of the sites: 59-63 bu/A (Beltsville), 52-56 bu/A (Carroll), 65-68 bu/A (Upper Marlboro), 67-71 bu/A (WMREC), and 66-80 bu/A (Wye). Figure 2 shows the yield at 13.5% moisture for each site. Yield was not statistically significant between planted populations, indicating that for these sites, a lower population could have been planted and yield could have been maintained.

Figure 2. Yield at 13.5% moisture.



Net Amount Per Acre

The gross amount per acre was calculated by multiplying the soybean price per bushel by the number of bushels per acre harvested. The net dollar amount was then calculated by subtracting the seed cost from the gross amount. Seed prices are the price before any discounts would be applied, and varied by site (Table 2). At the time of harvest, soybeans were an average of \$11.17/bu on the Chicago Board of Trade. At four out of the five sites, the highest net per acre was at a lower population than the lowest net per acre (Table 3). The highest net per acre was at the planted populations of 80,000 (Wye), 100,000 (Carroll), 120,000 (Beltsville and WMREC), and 140,000 (Upper Marlboro). The lowest net per acre varied across the five sites.

Table 2. Seed cost and variety at each site.

Site	Seed Cost (per 140,000 seeds)	Variety	Price on Chicago Board of Trade at Harvest (\$/bu)
Beltsville	\$75	Pioneer P31A95BX	11.17
Carroll	\$69	Pioneer P33A24X	
Upper Marlboro	\$82	Pioneer P25A82L	
WMREC	\$69	Pioneer P39T73E	
Wye	\$101	Pioneer P31A95BX	

Table 3. Net amount per acre. Numbers in green indicate the highest net per acre at each site; numbers in red indicate the lowest net per acre at each site.

Planted Population (in thousand plants per acre)	Net Amount (\$/A)				
	Beltsville	Carroll	Upper Marlboro	WMREC	Wye
50	--	--	--	--	704.26
80	611.71	546.19	674.82	720.95	800.03
100	616.27	557.25	669.17	693.06	676.74
120	637.51	553.78	662.94	734.20	667.03
140	629.05	547.41	680.43	679.96	789.02
160	589.74	548.01	649.92	705.16	738.36

Summary

Yield results indicate that optimum yield can still be achieved at lower populations. Based on this research, the planted population at the five sites in 2020, as well as two sites from 2019, could have dropped their populations down between 80,000 and 140,000 plants per acre, and still maintain optimum yield as well as an acceptable net amount per acre.