

## Soybean Populations and Yield

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For several years, the University of Kentucky has been investigating the effects of lower plant populations on seed yield. Those studies have indicated that final plant populations under 100,000 plants per acre are adequate for maximum yield. The Kentucky Soybean Board funded a project to investigate five populations seeded with and without an inoculant at five locations across Kentucky. The soybean was a 3.9 maturity and seeded in 15-inch rows at each location by Eugene Lacefield.

The results were mixed. At all locations, inoculant did not have a significant effect on yield. The lowest population to reach maximum yield was 80,000 seeds per acre at Lexington and Princeton and 180,000 seeds per acre at Western Kentucky University, Henderson and Marshall (Table 2).

The unusual weather patterns of the 2005 growing season may explain some of the variability in soybean yield response to seeding rates. The 2005 growing season experienced low rainfall totals for most of the state (Table 3). August was the wettest month of the summer and it is typically the driest! Consider the extreme weather of 2005 when evaluating the results from seeding rate studies.

In another study at Princeton, KY, maximum yield was obtained with 50,000 seeds per acre for two soybean varieties (Table 4). In another study at Lexington, KY, maximum yield was obtained at about 35,000 seeds per acre for the full season planting dates. However, for the short season planting dates, maximum yield was obtained at the higher populations of about 122,000 and 190,000 seeds/acre (Table 5). Again, weather played a role in crop response to seeding rates.

There is evidence that high yields can be obtained with lower seeding rates in Kentucky. The dry weather from 2005 does bring into question just how low of a seeding rate is warranted for maximum yields.

The results from studies in 2005 illustrate why the University of Kentucky sometimes appears slow in changing recommendations. We are trying to gather as much data as possible to provide the best possible recommendation for Kentucky producers.

**Table 1.** Minimum population needed for maximum yield from soybeans planted near Lexington, KY, 2003 and 2004.

Seeding Date	Season <sup>1</sup>	Cultivar	Mty	Minimum Population <sup>2</sup> plants/acre
24-Apr-03	Full	Stressland	4.5	42,500
24-Apr-03	Full	CF 461	4.6	53,400
24-Apr-03	Full	CF 492	4.9	49,800
21-May-04	Full	B283	2.8	92,300
21-May-04	Full	B336	3.3	72,100
21-May-04	Full	CF461	4.6	85,800
21-Jun-04	Short	B283	2.8	91,400
21-Jun-04	Short	B336	3.3	93,100

<sup>1</sup> Full season and short season. The short season was planted into no-till residue but did not follow wheat.

<sup>2</sup> Exponential rise to maximum, 3 parameter model: density required for 95% of yield that was achieved at maximum plant density.

**Table 2.** Seeding rate effect on soybean yields, averaged over inoculant treatment, 2005.

Location	Seeding Rate per Acre (X 1000)				
	20	80	100	120	180
Yield (Bu/A)					
Lexington	26.9	29.9	30.9	31.5	28.4
WKU	13.2	50.3	50.8	56.1	59.6
Princeton	26.1	53.6	53.8	53.8	53.0
Henderson	19.3	48.4	63.0	63.9	75.0
Marshall	33.4	56.0	59.9	58.2	63.5

**Table 3.** Rainfall departures from normal for the 2005 growing season.

Location	Mar	Apr	May	Jun	Jul	Aug	Sept
Precipitation (Departure from Normal, inches)							
Lexington	-0.91	-0.41	-1.83	-1.38	-1.95	+2.17	-2.31
WKU	-1.58	+1.47	-2.49	-2.30	-0.42	+4.43	-3.25
Princeton	-0.83	-0.19	-3.42	-0.76	-1.90	+7.53	-1.16
Henderson	-2.03	-.054	-1.18	-1.45	0.00	+1.66	-0.68
Marshall <sup>1</sup>	-1.38	-1.24	-4.35	-0.32	-1.63	+1.32	-2.47

<sup>1</sup> Mayfield data the closest location to Marshall County site.

**Table 4.** Seeding rate effect on soybean yield, Princeton, KY, 2005.

<b>Seeding Rate<sup>1</sup></b> <b>(viable seeds/A)</b>	<b>Avg. Final Stand<sup>2</sup></b> <b>(Plants/A)</b>	<b>Soybean Yield<sup>2</sup></b> <b>(Bushels/A)</b>
50,000	45,000	73 a
75,000	65,000	72 a
100,000	85,000	75 a
125,000	110,000	73 a
150,000	130,000	74 a
175,000	150,000	74 a
200,000	175,000	74 a
225,000	195,000	72 a

<sup>1</sup> Seeded May, 25, 2005 in 15-inch rows.

<sup>2</sup> Avg. approx. final stand of two varieties.

<sup>3</sup> Avg. of two varieties (3.9 RM and 4.7 RM). Varieties were not significantly different.

**Table 5.** Seeding rate on soybean yield, Lexington, KY, 2005.

<b>Population</b>	<b>Full Season</b>		<b>Short Season</b>	
	<b>B283</b>	<b>B336</b>	<b>B283</b>	<b>B336</b>
	<b>Yield</b>			
seeds/acre	Bu/acre			
17,400	17.1	23.9	27.1	28.8
34,800	23.9	35.5	33.4	33.6
70,000	15.6	35.5	38.0	38.7
121,800	16.3	35.6	49.4	44.3
192,000	12	31.2	50.1	46.5