

# **The Effect of Different Seeding Rates on Soybean Yield**

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## **Abstract**

The cost of soybean production is increasing each year. This is due in part to the introduction of new technology. With increases in cost of production, it is imperative that producers be economically disciplined and aware of modern research and technology. Producers must be knowledgeable of the important factors that play a crucial role in the production of soybeans and their profitability. Seed quality, planting date, fertilizer, soil type, row spacing and seeding rate are just a few vital factors that they must consider when preparing to grow soybeans or any other production row crop.

## **Dedication**

This paper is dedicated to my loving and supportive family who have always stood beside me and kept me in their thoughts and prayers through all my endeavors.

Mom, Dad and Heather, thank you for being the greatest parents and sister a person could ever ask for in their life. You have taught me right from wrong, morals, independence, the bible and you have shown me Christ through the way you live your everyday lives. Words cannot express the deep gratitude that I feel towards all of you.

I would also like to dedicate this paper to the loving memory of Mathew Hurst Barnes. Matt, thank you for touching so many lives in your short time here on earth. I know that you are continuing to touch many more in heaven.

## **Acknowledgement**

I would like to thank first and foremost Mr. Bob Williams and Mr. Tim Campbell for all the support and guidance that they have provided for me through my stint as a graduate student and working on this research project. Additionally, I would like to thank all the extension agents in Gibson, Obion, Lake, Weakley and Henry Counties. Without their help, none of this research would have been possible.

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## **Objectives**

- The cost of soybean seed has increased over the last few years due to the introduction of new technology. The main objective of this study is to evaluate the effect of soybean seeding rate on yield, and to find an optimal seeding rate that benefits the producer by minimizing production input cost; thus maximizing net return.
- A secondary objective of the study is to show soybean producers how reduced seeding rates may minimize input cost; without decreasing yield. Finding an optimal soybean seeding rate for West Tennessee soybean producers will increase the overall profitability of the soybean crop. Finally, this research will show the economic impact on the soybean producer's net income as affected by seeding rate.

## **Chapter 1**

### **Introduction**

#### **Variability of Soybean Plant Populations**

The soybean plant is a member of the Leguminosae family. All plants in this family are referred to as legumes and most have the ability to supply their own nitrogen needs. The average soybean is composed of 40 percent protein, 21 percent oil, 34 percent carbohydrates and 5 percent ash on a dry matter basis. Soybeans are an important crop in Tennessee and rank in the top three for cash receipts in row crops each year.

There are many competitive factors that play an extremely important role in the production of soybeans and their profitability to the producer. Seed quality, planting date, fertilizer, soil type, row spacing and seeding rate are just a few vital factors that producers must consider when planting soybeans or any other production crop. It is important to plant the number of seeds that will achieve the desired number of plants per acre in a uniform stand of soybeans. Data collected in the mid-southern U.S. indicate that a density of 80,000 to 120,000 uniformly distributed plants per acre is adequate for maximum yield. Plant populations that fall below this range can be tolerated with little or no yield reduction if the stand is uniform and the variety branches profusely. The quality of the seed planted, the capability of the soybean planter, and the conditions following planting determine the final plant population (Heatherly and Hodges, 1999). The seeding rate or plant population is one of the most important factors when it comes to profitability for the producer. Seed cost and technology fees are increasing rapidly. With these increases, producers must be more economically disciplined and aware of modern

research and technology. Seeding rate is an area of the production cycle where the producer can possibly reduce an input without limiting the yield; thus realizing additional net return. “Farmers tend to plant 25% more seed than needed. Some of that is to make up for poor equipment or lack of calibration. Some of it is just habit, but some producers feel that the high seeding rates are needed for better weed control. Most people can reduce seeding rate by 25% and without affecting either weed control or yield and therefore increase profits.” Seeding rate is dependant on the size of the seed, width of row and the germination rate of seed (Soybean Digest, 2002). The measurement of seeds per row foot is a good planting guide because of the large variation in seed size among different varieties from year to year.

It is important to know that most purchased seed are tagged (labeled) at 80 percent germination. Eighty percent is normally the lowest germination acceptable by certification standards and establishes the lower limit for seed beans unless extenuating circumstances cause this to be lowered. You may purchase seed labeled 80 percent that actually have a higher germination rate, resulting in a thicker stand than expected.

Although plant populations can vary considerably without affecting final yield, there can be significant effects upon plant growth and development. For example, thin stands may cause shorter plants with large stalks, more branches, lower pod set, and more pods per plant. Thick stands may be the exact opposite, contributing to taller plants with smaller stalks, fewer branches, higher pod set, fewer pods, and more barren stalks.

Considering soybean seed costs and their ability to compensate for wide plant spacing, the utmost attention should be given to seeding rates (Mississippi State Extension PB 1194, 2004).

## **Chapter 2**

### **Need Assessment**

A survey was conducted following the 2004 crop year to determine a variety of information pertinent to crop production in Northwest Tennessee. The counties represented in the survey were Dyer, Weakley, Lake, Gibson, Henry and Obion Counties. Of the 32 producers surveyed, 29 responded representing 9.26 % (45,573 acres) of the total soybean row crop acreage in these six counties. The producers were asked if they decreased their soybean planting rate this year and 28 producers responded to this question. The average seeding rate of group IV soybeans among the 28 producers was 176,000 seeds per acre (SpA) and the average seeding rate of group V soybeans among the 28 producers was 175,000 SpA. Thirty nine percent of the producers participating in the soybean portion of the survey reduced their group IV maturity soybean seeding rate to 166,000 SpA, while 42% of the producers participating reduced their group V soybean seeding rate to 170,000 SpA. Approximately 40 % of the producers decreased their seeding rate by an average of 10,500 SpA. The 2003 survey indicated that the average seeding rate of all producers was at 181,364 SpA.

This survey alone reveals a need for more local research to determine the effects of soybean seeding rates (UT Extension, 2004).

## Chapter 3

### Literature Review

Field studies of soybean populations and maize following soybeans at different populations were carried out at the University of Nebraska Agricultural Research and Development Center near Mead, NE in 1994, 1995, and 1996. The objectives of the study were to (i) determine soybean yield at different plant populations, (ii) investigate residual soil N, chlorophyll –N- yield relations, and yield benefits to a following maize crop from these different soybean populations; and (iii) compare N credits from soybean assessed with fallow and cereal plots as references. The studies were established using an early maturity Group III determinate soybean variety, Hobit 87. Eight soybean plant populations were established on 17 May 1994 in rows that were 50 cm wide and were repeated on 25 May 1995. The target plant populations were 10, 50, 100, 200, 300, 500 and 600 thousand plants / ha (1 hectare or ha = 2.4710538 acres). A medium maturing hybrid maize plot (Pioneer 3417R at 55,000 plants / ha with no N) and a fallow plot were included for a total of 10 treatments. The seed yield was taken at the varying soybean plant populations in both 1994 and 1995. An increase in yield was revealed as soybean populations increased up to 51,000 plants / ha in 1994. No further increase was observed with a further increase in plant population. A similar response was observed in 1995, but differences among populations ceased at 129,000 plants / ha. Thus, a plant population beyond 129,000 plants / ha might not be necessary to maximize grain yield for Hobbit 87 in 50 cm rows (19.69 inches). This suggests that maximum yields could still be obtained using fewer seeds, thus reducing seed costs (Clegg and Ennin, 2001).

Glyphosate resistant soybean has been widely accepted throughout the southeastern and Mid-Atlantic regions. The technology fee that accompanies the purchase of glyphosate resistant soybean causes these seed to be more expensive than cultivars that are not glyphosate resistant. Additionally, the cost of production has increased due to the producer's inability to retain a portion of their harvested crop for seed, something that many producers had previously done as a cost saving practice. Producers were able to save their own seed relatively inexpensively, thus planting soybeans at higher populations than actually needed (Campbell, 2005). It is arguable whether the increased price of glyphosate resistant cultivars offsets the reduction in herbicide cost. However, with the discovery of a glyphosate resistant weed, marestail (*Conyza canadensis*), producers are questioning the necessity for increased herbicide inputs that may further increase greater production costs.

A potential cost reducing practice would be to reduce the recommended seeding rate when planting glyphosate resistant cultivars. However, most soybean seeding rate recommendations are based on research conducted on conventional soybean cultivars rather than the glyphosate resistant cultivars (Kratovich et al 2004). Additionally, seeding rates vary a great deal from state to state. These variations in seeding rates vary across the country due mainly to differences in soil type (Norsworthy and Fredrick, 2002).

During the 2000 through 2002 crop years, glyphosate resistant soybean cultivars were grown under both full-season and double crop production systems at two locations each year. The cultivars used represented the range of relative maturity groups commonly grown in Maryland. The split-split plots were the four seeding rate treatments

of the (i) recommended seeding rates for the full season (43,250 seeds / ha) and double-crop (555,750 seeds / ha) production systems and rates that were (ii) 40 and (iii) 20% less than and (iv) 20% greater than those two recommended rates( 1 hectare = 2.4710538 acres). The conclusion of this research revealed that 40% reduced seeding rate had a yield that was significantly less than the standard. During both years, the 20% reduced seeding rate produced a yield that was not significantly different from standard seeding rates. Also, there was no significant yield benefit for the double crop soybean to the 20% increased seeding rate. Because there was no significant differences in yield observed between the 20% reduced rate and the currently recommended standard rate, a 20% seeding rate reduction to approximately 346,000 and 445,000 seeds / ha for glyphosate resistant soybean grown under full season and double crop production systems in the Mid-Atlantic can be an option for reducing input costs for both production systems (Kratovich et al 2004).

In 2000 through 2002, Norsworthy and Fredrick conducted research to evaluate the seed yield potential of four commonly grown glyphosate resistant maturity group V through maturity group VII cultivars planted at the current recommended rate and a lower than recommended rate for drilled soybean. They also evaluated the distribution of seed yield between the main stems and branches to reveal how the soybean may compensate for differences in plant population. The cultivars used for the study were Pioneer 95B32 (early MG V), Hartz 6255 (early MG VI), Delta and Pine Land 6880 (late MG VI), and Hartz 7550 (mid-MG VII). Pioneer 95B32 is a commonly planted variety in the Southeastern portion of the United States and is usually planted behind wheat. The higher seeding rate used in this particular study came from the rate recommended to

South Carolina farmers in 2000. The cultivars were selected based on their high performance in the Clemson University variety trials. The soybean densities for each year were similar for each seeding rate and ranged from 72% to 85% of the seeding rate. Seed yields taken at the greater population were shown to be the highest due to the greater density of the main stems at that seeding rate. Decreasing the seeding rate lowered the seed yield by only 23% over years, whereas plant density was 40% less at the lower seeding rates meaning that the main stems compensated for the lower than recommended seeding rates by producing more seed yield. In 2000, a 42% increase in seed yield from the branch at the lower than recommended rate offset the decrease in seed yield at the main stem fraction. In all years studied, the branch fraction seed yield was more closely related with total seed yield at the lower than recommended rate rather than at the recommended rate. This research shows that the soybean plant has the ability to compensate main stem and branch fraction seed yields at a lower than recommended seeding rate, yet it varies with the different selection of cultivars available and also environmental conditions under which the crop is produced. In this particular study, rainfall pattern within the growing season was shown be more important than seeding rate and cultivar selection (Norsworthy and Frederick, 2002).

According to a study in Keiser, AR 1997, Manokin grain yields at higher populations within each row spacing tended to decline due to lodging. At a low population density, the determinate Manokin had greater branching and higher yielding capabilities than did the other variety in the study, A4922. Thus, revealing that at high populations, lodging can play a factor in the final yield, particularly if lodging is severe (Ball et al., 2000). Very high populations in some crops, including soybean, may

decrease harvest index (a measure of how much important material, such as seeds, a plant produces. Harvest index =  $100 \times \text{Seed mass} / \text{Plant mass}$ ) because of lodging or barren plants (Weber et al. 1966).

A study was conducted by Holshouser and Jones to compare the yield of double cropped soybean and leaf area index (LAI) response to plant population of maturity group III and V varieties at populations ranging from 50,000 to 300,000 plants / acre (1 hectare = 2.4710538 acres). Soybean generally require a LAI, which is the ratio of unit leaf area per unit ground area, of 3.5 to 4.0 by the early reproductive stages in order to maximize yield for that growing season. Most full-season soybean is able to meet this leaf area requirement; however, double-crop soybean does not always obtain the necessary leaf area. The LAI is defined as the one sided green leaf area per unit ground area in broadleaf canopies, or as the projected needle leaf area per unit ground area in needle canopies. The study revealed that the maturity group III variety used in this research yielded up to 12 bushels/acre less at lower population, but equal to or up to 4 bushels/acre more than the maturity group V variety at higher populations. The ability to maximize yield depended on the ability of soybean to obtain a LAI of 3.5 to 4.0 by flowering. However, yield did not continue to increase with higher LAI levels. In the 2001 data, the ratio of yield increase to increasing population was less. For the maturity group V variety, the predicted highest yield was similar to the previous year, but much higher yields were realized at lower populations. This could have possibly been due to the higher LAI levels at these populations. It is important to mention when reviewing this research that the 2000 and 2001 crop years were record years for Virginia, where this study was conducted. Yield of the later maturity group was higher at lower populations

than the early maturity group. However, yields were equal at the highest-tested maturity group III population. This research also revealed that plant population recommendations for double-crop systems might need adjusting to reflect soybean maturity groups. Early maturity soybeans may show a significance response in yield to higher than normally recommended populations. On more productive soils which may be capable of producing more leaf area, raising plant population may increase the leaf area, but not necessarily increase the yield at the same rate as in these experiments. The recommendations from this particular study show that plant populations should be site specific to insure the highest yield and the lowest input cost. Plant populations should be

**Table 1. Final Plant Population Suggestions (no./acre x 1,000) for Virginia Soybeans  
David Holshouser, Virginia Tech Extension Soybean Specialist**

Avg. Yield Potential* (bu/acre)	Maturity Group	May 1-31	June 1-15	June 16-30	July 1-15
20-30	III	140	160	----	----
	IV	130	150	200	220
	V	120	140	180	200
30-40	III	120	140	200	-----
	IV	110	130	180	200
	V	100	120	160	180
>40	III	120	120	180	-----
	IV	100	110	160	180
	V	100	100	140	180

To Obtain Seeding Rate in Seeds per Foot of Row:

Seeding Rate = Desired plant population ÷ (43,560 sq. ft./acre ÷ row width in ft.) ÷ % emergence

$$\begin{aligned}
 \text{Example (15" rows):} &= 120,000 \div (43,560 \div 1.25 \text{ ft.}) \div 0.85 \\
 &= 120,000 \div 34,848 \div 0.85 \\
 &= 4.1 \text{ seeds per foot on 15" rows}
 \end{aligned}$$

**Table 2. Seeding Rates for Soybean Production in Tennessee. UT Extension  
Publication 1608, Page 5.**

<b>Row width (inches)</b>	<b>Feet of row acre</b>	<b>Seeding Rates (seeds/ft.) (plants/ft.)</b>		<b>Final plant population/A</b>
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**Conventional**

40	13,068	10-12	8-10	104,544-130,860
30	17,424	8-10	6-8	104,544-139,392
20	26,136	6-8	5-7	104,544-156,816
10	52,272	4-6	3-5	156,816-261,360
7	74,674	3-5	2-4	149,348-298,696

**No-till**

20	26,136	8-10	6-8	156,816-209,088
10	52,272	6-8	4-6	209,088-313,632

<b>Broadcast</b>	<b>40-60 lbs./A</b>			
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based on the crop's ability to achieve adequate LAI (leaf area index) and not solely on plant population- yield experiments. However, by identifying fields with low LAI, a producer can make a more educated decision on varying plant populations (Holshouser and Jones, 2003). Tables 1 and 2 shows the variation in recommended seeding rates by Virginia Tech Extension and University of Tennessee Extension. As you can see, the recommendations by Virginia Tech Extension are separated by maturity group, yield potential and planting date. The recommendations by University of Tennessee Extension are separated by row width and type of planting.

Research conducted in Wisconsin in crop years 1997 through 1999 over six locations, which represented the different environmental regions, revealed that planting soybeans in narrow rows (38 cm or less) resulted in the greatest yield in all zones and thereby gives an option to reduce input costs. However, in this particular study by Bertram and Pederson, 2004, soybean yield increased as plant population increased in southern Wisconsin and central Wisconsin. On the other hand, in northern Wisconsin, no differences were observed among different plant populations in 19-38 cm rows and no differences were observed among plant populations using 76 cm rows and glyphosate resistant cultivars. This research concludes that when using glyphosate resistant cultivars it may be economically feasible to reduce seeding rates in parts of Wisconsin, as the results from northern Wisconsin demonstrated. The regions of Wisconsin are environmentally different from the southern portion of the United States, but the principle still remains the same. Lowering seeding rates can be an option for lowering production cost, however factors must be considered before making any changes.

According to all the studies reviewed previously, cultivar, maturity group, soil

type, yield potential of production ground and moisture all must be considered when optimizing the seeding rate to obtain the maximum yield (Bertram and Pederson, 2004).

Jim Beuerlein, an Ohio State University Extension agronomist, said that growing conditions impact plant size, which, in turn impacts the most profitable plant population. By familiarizing oneself with soil type and growth habit of cultivars, controlling diseases, and wisely utilizing production practices, growers can plant the minimum number of seed that maximizes both yields and profits. Buerlein conducted research over two years to pinpoint the seeding rates that made the most profit under various growing conditions. The studies revealed that soybean grown under good growing conditions (ideal weather, soil type and minimal disease) maximized profit with lower seeding rates than when plants grow under poor conditions. In the 2001 study, the maximum profit was gained at the seeding rate of 145,000 SpA. In 2002, when the growing conditions were poor, the maximum profit came from about 200,000 SpA, says Buerlein. The conclusion of the study is that seeding rates can be lowered on good ground, but make sure seeding rates are up on your poor ground (Pollack, 2005).

### **Studies with Similar Protocols**

In 2002, The Ohio State University crops team conducted a soybean seeding rate comparison study to evaluate the effect of seeding rate on yield of soybeans. Three population rates were used to determine the effect of seeding rate on soybean yields. They were 110,000, 165,000 and 220,000 SpA. The seed used in this particular study had germination percentage of 90%. The emerged population was taken at the V2 stage of the soybean using the loop method. Harvest population was determined by counting the soybean plants in 3 feet of row for four rows per treatment. Table 3 shows the results

of The Ohio State University research on seeding rate and its effect on yield  
(Sundermeier, 2002).

**Table 3. Ohio State University Effect of Soybean Population on Yield**

<b>Seeding Rate</b>	<b>Population growth stage V2</b>	<b>Harvest Population</b>	<b>Yield</b>
<b>(plants/A)</b>	<b>(plants/A)</b>	<b>(plants/A)</b>	<b>(plants/A)</b>
<b>110,000</b>	<b>134,522 a</b>	<b>106,175 a</b>	<b>59.3 a</b>
<b>165,000</b>	<b>179,365ab</b>	<b>147,010 b</b>	<b>61.8 b</b>
<b>220,000</b>	<b>253,300</b>	<b>242,300 bc</b>	<b>62.6 b</b>
<b>LSD (0.05)</b>	<b>97,823</b>	<b>39,096</b>	<b>1.3</b>
<b>F-test</b>	<b>4.6</b>	<b>2.3</b>	<b>1.4</b>

**\*\*\*Means followed by the same letter are not significantly different**

**(Sundermeier, 2002).**

Another similar study was conducted by Dr. Ann Dorrance, OSU Extension Specialist in Plant Pathology. This study looked at three different seeding populations with two different seed treatments planted on 15 inch rolls. Populations were taken three different occasions, one week after emergence, at V2-V3 stage, and at harvest. The study revealed no significant differences in yields could be attributed to either seeding rate or the use of a fungicide. Also, no phythophthora was detected in the field even though conditions were favorable. Table 4 shows the mean yield and mean stand counts for the three different timing intervals for the variable treatments of seeding rate (Dorrance, 2002).

**Table 4. Ohio State University Extension Effect of Varying Soybean Seeding  
Populations on Yield**

<b>Treatment</b>	<b>Stand Count Emergence</b>	<b>Stand Count V2-V3 Stage</b>	<b>Stand Count Harvest</b>	<b>Yield Bu/A</b>
Population Seeds/A				
200,000	150,400 a	145,200 a	144,400 a	56.1 a
160,000	120,200 b	123,600 b	117,800 c	56.1 b
120,000	96,700 c	100,600 c	95,000 c	55.5 c
LSD (P=0.05)	8,700	11,000	5,300	N/S

**\*\*\*Means with the same letter are not significantly different at P=0.05.**

## Chapter 5

### Materials and Methods

Three different seeding rates were planted over 6 counties located in northwest Tennessee to determine the effect of seeding rate on yield. The three population rates used were 125,000, 150,000 and 175,000 plants / acre. The cultivar used in the study was USG 5601T, a conventional group V maturity soybean. All plots were planted on 15 inch row widths, however each plot was planted with different equipment depending on the specific volunteer producer. A total of 30 observations were taken over the six counties. Each plot was planted by a different producer using their own equipment. The plots were planted on five different planting dates; June 4, June 29, June 28, May 24, and June 24 2004. Stand counts were taken post plant emergence by measuring 1/1000<sup>th</sup> of an acre, 34 ft 10 inches for 15 inch row widths. Each observation was taken to harvest and weighed on a grain weigh wagon to determine the yield for that specific plant population. A statistical analysis was conducted on the yields to determine if there were any significant differences among the different plant populations. The following charts were used as references for conducting stand counts on the demonstration plots.

According to Area UT Extension Grain Specialist Bob Williams, there is a range of 2,500 to 3,500 seeds per pound in every bag of seed. This variation in quantity of seed is due to the significant variation in the size of the soybean seed. For this particular study, 3,000 seed per pound was used for all calculations. Soybeans are sold in 50 pound bags, therefore each bag was estimated to contain 150,000 seed. The average cost of a bag of soybean seed was \$34, therefore seed cost was \$0.23 / 1000 seed (Williams, 2005).

**Table 5. Seeding Rates or Plant Populations for Various Row Spacings.**

Seed or Plants/Ft.	Row spacing (inches)								
	7.5	10	15	30	32	34	36	38	40
1	69696	52272	34848	17424	16335	15374	14520	13756	13068
1.5	104544	78408	52272	26136	24503	23061	21780	20634	19602
2	139392	104544	69696	34848	32670	30748	29040	27512	26136
2.5	174240	130680	87120	43560	40838	38435	36300	34389	32670
3	209088	156816	104544	52272	49005	46122	43560	41267	39204
3.5	243936	182952	121968	60984	57173	53809	50820	48145	45738
4	278784	209088	139392	69696	65340	61496	58080	55023	52272
4.5	313632	235224	156816	78408	73508	69184	65340	61901	58806
5	348480	261360	174240	87120	81675	76871	72600	68779	65340
5.5	383328	287496	191664	95832	89843	84558	79860	75657	71874
6	418176	313632	209088	104544	98010	92245	87120	82535	78408

**Table 6. Various Row Lengths to Equal 1 Acre**

Row Feet in 1 Acre	Row spacing (inches)								
	7.5	10	15	30	32	34	36	38	40
	69696	52272	34848	17424	16335	15374	14520	13756	13068

<b>Table 7. Distance Needed to Calculate 1/1000th of an Acre.</b>									
	<b>Row spacing (inches)</b>								
	<b>7.5</b>	<b>10</b>	<b>15</b>	<b>30</b>	<b>32</b>	<b>34</b>	<b>36</b>	<b>38</b>	<b>40</b>
<b>1/1000<sup>th</sup> of an Acre</b>	<b>69' 8"</b>	<b>52' 3"</b>	<b>34' 10"</b>	<b>17' 5"</b>	<b>16' 4"</b>	<b>15' 4"</b>	<b>14' 6"</b>	<b>13' 9"</b>	<b>13' 1"</b>

**\*\*\*Charts were taken from the 2004 Dyer County UT Extension Agricultural Demonstration Results Publication.**

## Chapter 6

### Experimental Results and Discussion

**Table 8. 2004 Population Study, Effect of Different Seeding Rates on Soybean Yield.**

#### County Yields

Variety/Population	Dyer	Henry	Gibson	Lake	Obion	Weakley
USG 5601T	6/4	6/29	6/28	5/24	6/25	6/4
Planting Date		DCRP	DCRP		DCRP	
100-110,000	60.7, 61.4					52.1, 52.7
111-120,000	61.5, 62.3			72.4		59.1
121-130,000			48.6, 46.8	59.1	47.3, 48.4	
131-140,000						
141-145,000		43.4				
146-150,000			49.9, 46.4		45.1, 42.6	41.8, 45.8
151-160,000	59.2, 63.1			69.2		48.3
161-170,000		43.0				
171-180,000			44.9, 48.2		45.7, 43.8	
181-190,000		39.4				
Average	61.4	41.9	47.5	66.9	45.5	50.0

DCRP = doublecrop with wheat

30 observations, 6 counties, 3 doublecrop and 3 full season

<146,000 = 14 observations @ 6 locations = 55.40 bu/a

>146,000 = 16 observations @ 6 locations = 48.52 bu/a

<126,000 = 12 observations @ 5 locations = 56.09 bu/a

126-155,000 = 9 observations @ 5 locations = 46.93 bu/a

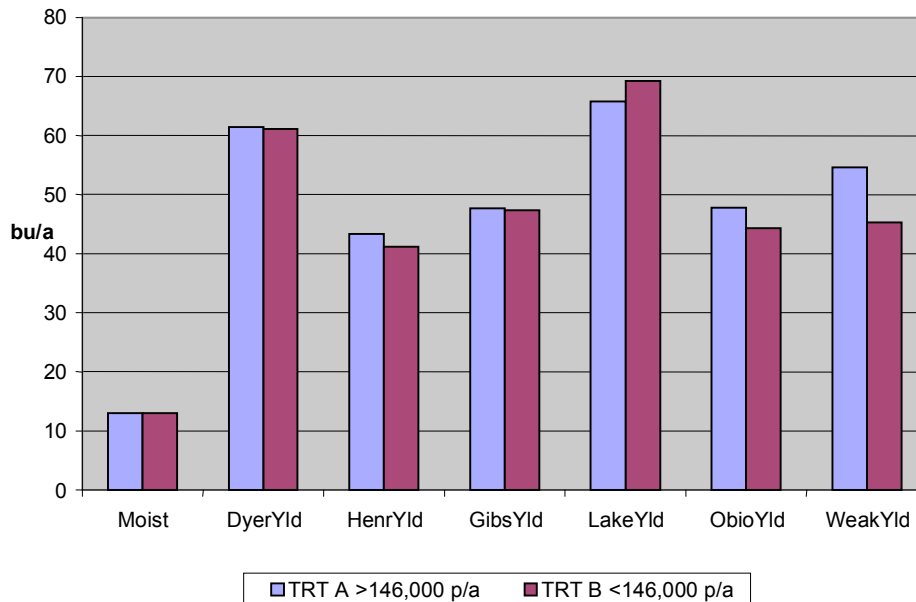
>156,000 = 9 observations @ 5 locations = 52.80 bu/a

**Table 9. Duncan's Multiple Range Test for 2004 Soybean Population Study.  
Average County Yields**

Treatment	Average	Dyer	Henry	Gibson	Lake	Obion	Weakley
>146,000 plants/acre	53.5 a	61.48a	43.4a	47.70a	65.75a	47.85a	54.63a
<146,000 plants/acre	51.4 a	61.15a	41.2a	47.35a	69.20a	44.30a	45.30a

\*\*\*Means with the same letter are not significantly different at P = 0.05.

**Chart 1.  
Effect of Seeding Rates on Soybean  
Variety USG 5001T**



The soybean population study covered 6 counties with 30 observations recorded. Each observation had a protocol to plant the soybean at three different plant population rates; 125,000, 150,000 and 175,000. After emergence of the soybean plants, stand counts were taken on each observation. As Table 8 shows, population rates were scattered ranging from 100,000 to 190,000 plants / acre. These variations in plant populations were related to the different types of planters used, soil type and changes in weather pattern. Because of unequal numbers of observations at each population for each county location, an average of the yields for each county for populations less than and greater than 146,000 plants/acre were compared using a Duncan's Multiple Range Test. The goal of the analysis was to determine whether or not there was a statistical difference between yields of the two ranges of populations studied. The study showed that there was no significant difference between the two ranges of plant populations. The data showed no significant difference between soybean yields for seeding rates less than 146,000 plants / acre and seeding rates greater than 146,000 plants / acre.

A survey was conducted following the 2004 crop year to determine a variety of information pertinent to crop production in northwest Tennessee. The counties represented in the survey were Dyer, Weakley, Lake, Gibson, Henry and Obion Counties. Of the 32 producers surveyed, 29 responded representing 9.26 % of the total row crop acreage in these six counties. These 29 producers represented 45,573 acres of soybeans that were produced in these six northwest Tennessee counties. The producers were asked if they decreased their soybean planting rate this year and 28 producers responded to this question. The average seeding rate of group IV soybeans among the 28 producers was 176,000 SpA and the average seeding rate of group V soybeans among the 28 producers

was 175,000 SpA. Thirty nine percent of the producers participating in the soybean portion of the survey reduced their group IV maturity soybean seeding rate to 166,000 SpA. Forty two percent of the producers participating reduced their group V soybean seeding rate to 170,000 SpA. Approximately 40 % of the producers decreased their seeding rate by an average of 10,500 SpA. This 2004 survey indicated that the average seeding rate of all producers for all maturity groups was 172,300 SpA. The 2003 survey indicated that the average seeding rate of all producers was at 181,364 SpA. The reduction in seeding rate for these two years was 9,064 SpA. With seed cost of approximately \$0.23/1000 seed, soybean producers had an economic benefit of \$2.12 per acre by reducing their soybean plant population by 9,064 SpA.

The data in the 2004 Soybean Populations study covering the six county area shows that there is no significant difference between yields when soybeans were planted at populations less than or greater than 146,000 plants/acre. Thus, if soybean producers were to reduce their plant population from the 2004 average of 172,300 plants/acre to the studied 146,000 plants/acre, there would be a reduction of 26,300 plants/acre. With seed cost of approximately \$0.23/1000 seed, a soybean producer could yield an economic benefit of \$6.13/acre. According to the Tennessee Department of Agriculture, there were 498,000 total soybean acres in the six county area included in this study in 2004. If soybean producers in the six county area used in this study had reduced their plant population by 26,300 seeds/acre, seed cost would have resulted in a savings of \$3,052,740.

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