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G1547

Using Soybean Yield Data to Improve Variety Selection — Part II

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This NebGuide describes a selection process which systematically compares soybean yields and traits to arrive at a group of varieties that is both diverse and well suited to a particular operation.

Reliable field trial data is one of the best sources of information for soybean producers selecting seed for the next season. This NebGuide presents a method of comparing yield results and variety traits to develop a "short list" of those varieties best suited to an individual operation. The example provided here uses information from the University of Nebraska–Lincoln Extension Circular, "Nebraska Seed Guide," EC101, although the same process could be used with variety information from other sources. (UNL Crop Variety Trial results also are available on the Web at *varietytest.unl.edu.)*

To choose the best variety, first examine the latest copy of the "Nebraska Seed Guide." (We used the "2003 Nebraska Seed Guide" in this example since it was the most current version available at the time of writing.) Along with the variety trial yield data, the seed guide provides: 1) plot locations, problems, farmer entries; 2) cooperators, soil types, planting and harvest dates; 3) average performance at each location; and 4) maps of test sites.

For the purpose of illustrating this process, let's say the farm is in Butler County, Nebraska and the tests at Saunders and Clay counties best apply (see *Table I*). First look at the column with the average yields of these two locations. To simplify this we have listed only the top 24 out of 49 entries in the test. Look at the difference required for significance (LSD), which in this test is more than or equal to 4.5 bushels (see bottom row). The Least Significant Difference (LSD) is listed at the 0.05 probability level. These values indicate how large a difference is needed to be 95 percent confident that one variety is superior to another. Differences between varieties that are equal to or less than the 0.05 LSD have only a 1 in 20 likelihood of being different due to chance or error. By subtracting 4.5 bushels from the top yielding variety (71.5 bushels per acre), we get 67 bushels per acre. We have highlighted in green those varieties with a yield from 67 to 71.5 bushels per acre. Remember that we listed only 24 out of the 49 entries in this test, so you will be highlighting all but one of the entries. This is the high yielding group of varieties. If possible, select varieties from this group.

Varieties which perform well at various locations are preferred over varieties which only respond well at a single site where conditions favor that variety. Hence, to determine which varieties did well at both locations, highlight the top yielding varieties in both Saunders and Clay counties. For Saunders, since the LSD is 3.5, we subtract 3.5 from the top yield, which is Triumph TRX2J28RR at 69.1 bushels per acre. We have highlighted all those varieties yielding from 65.6 to 69.1 bushels per acre. In Clay County, we have highlighted those within 5.7 bushels of the highest yielding variety (78.2 - 5.7 = 72.5), which is Garst 2903RR at 78.2 bushels per acre. All of the highlighted varieties within a column are not significantly different from the highest yielding variety, given the variability inherent in our trials. In *Table II* the yields have been grouped according to the LSD and are indicated by color shading. The lower section of *Table II* shows the range of numbers for each LSD group and each crop trait.

Next, assure that there is some diversity in the top-yielding varieties by examining and comparing other variety characteristics such as bushel weight. As with yield, the higher the bushel weight the better. The least significant difference for bushel weight is 0.4 lb per bushel. Our highest bushel weight is 58.4 lb per bushel. By subtracting the LSD from that, the first group is 58.0 to 58.4, which we have shaded in green in *Table II*. The other bushel weight groupings in *Table II*, as indicated by the following colors, are: 57.9-57.5 – yellow; 57.0-57.4 – salmon; 56.9-56.5 – brown, and 56.4-56.0 – blue. With only one variety included in the high bushel weight group (green), select it and then move to the next group (yellow) to select other varieties that would help ensure genetic diversity.

This selection process can then be continued with other categories of plant characteristics, such as plant lodging. The grouping of plant lodgings starts with the lowest score, since

that is preferred, and works up. The LSD for plant lodging is 0.4 and the lowest rating is 1.1. The lodging groups in *Table II*, as indicated by the following colors, are: 1.1 to 1.5 – green; 1.6 to 2.0 – yellow; 2.1 to 2.5 – salmon; and 2.6 to 3.0 – brown. Since not all 49 entries are listed, some groups (blue and purple) are not represented in the abridged table.

Of the high yielding group, nine also were in the lowest lodging group (green). To insure diversity we may only grow one of these or we may grow more of these as we separate them into groups, using the other characteristics and LSDs to insure diversity. Likewise, twelve of the top yielding varieties were in the next lodging group (yellow). Again, we recommend growing only one of these unless other characteristics are used to help insure genetic diversity. Continue using this logic until you have two to three or more new varieties to grow each year.

It may be better to go through the whole process on all variables before screening any. The ideal situation would be to select varieties that are the best (shaded green) in all characteristics of interest, but doing this likely would not provide genetic diversity. To ensure diversity, select varieties from different LSD levels (shaded non-green) in traits that are of less concern for a particular system or operation, i.e. seeds per pound or plant height. Use information from seed comparisons on grower plots to supplement this process.

The next step in selecting diverse, high-yielding varieties is to examine last year's yields. As an example, *Table III* includes data for a hypothetical farm.

Examine the variety publication to see if any of the varieties on "your farm" (*Table III*) were included in the tests. Two are highlighted in *Table IV.* We add the yields, lodging, and grain protein numbers from the University of Nebraska test results in the adjusted columns.

To compare "your soybean" yields and those in the NU test, adjust the yield on "your farm". This is done in *Table V*. For example, the yield in the NU test was 10 bushels higher for Kruger and 11 bushels higher for Sands or 10 bushels higher on the average. Therefore, yields for the other hybrids will be increased by 10 bushels per acre to compare them. See *Table VI*. We also will make adjustments for lodging and grain protein

Table I. Early Roundup Ready variety tests in Saunders and Clay counties, 2003. Entries represent the average of the two sites for each of the identified traits, except for *Yield* which includes entries for the average and for both sites. Areas shaded in green indicate the top yield producers, according to the Least Significant Difference (LSD) grouping.

Brand	*Variety*	*Yield*			*Bushel Weight*	*Plant Lodging*	*Plant Height*	*Grain Seed*	*Grain Protein*	*Grain Oil*	*EPVA*		*Maturity*
		Average	*Saunders*	*Clay*									
		bu/A	*bu/A*	*bu/A*	*lb/bu*	*Rating*	*Inches*	*/lb*	*Pct*	*Pct*	*$/A*	*MO*	*Day*
TRIUMPH	TRX2J28RR	71.5	69.1	73.9	56.7	1.9	40	3200	35.65	19.39	415.42	9	25
KRUGER	289 + RR	70.9	67.1	74.7	57.3	1.2	35	3230	36.44	19.59	419.73	9	27
LG SEEDS	C9284RR*	70.6	67.6	73.6	56.2	1.6	32	2990	36.92	19.10	418.31	9	27
KRUGER	322-2 RR	70.5	64.7	76.2	57.2	1.2	37	3210	36.24	19.66	416.66	9	27
LATHAM	E3140R	69.9	64.4	75.3	56.9	2.2	40	2950	37.78	19.04	420.80	9	29
DYNA-GRO	D.G. 31G30	69.8	68.2	71.3	56.5	1.5	31	3030	36.82	19.64	416.36	9	27
LATHAM	E2857R	69.8	63.4	76.1	57.0	1.9	42	3070	36.95	19.95	420.89	9	28
KRUGER	260 RR	69.6	64.9	74.3	58.4	1.6	35	3330	37.65	18.84	417.25	9	25
RENZE	R2914RR	69.6	67.2	71.9	56.6	1.5	32	3100	36.41	19.24	410.99	9	27
RENZE	R2724RR	69.6	65.7	73.4	56.7	1.3	34	3260	36.18	19.93	412.03	9	26
KRUGER	292 RR	69.6	68.3	70.8	56.2	1.4	31	3020	36.27	19.19	408.20	9	27
NUPRIDE	8294RR	69.0	64.5	73.4	56.6	1.9	41	3230	36.40	19.58	409.17	9	26
LATHAM	E3245R	68.8	61.8	75.8	57.1	1.7	37	3300	38.02	18.76	415.90	9	30
DYNA-GRO	D.G.37B28	68.8	63.1	74.5	55.8	1.7	36	3080	36.12	20.11	409.02	9	25
TRISOY	2933RR	68.7	67.7	69.6	56.2	1.6	31	3020	36.47	19.72	407.73	9	27
SANDS	SOI 2872RR	68.7	64.1	73.2	56.4	1.8	40	4260	37.26	20.10	415.98	9	25
KRUGER	251 RR	68.4	66.7	70.0	56.7	1.9	37	3240	36.97	19.97	411.43	9	24
GARST	2903RR	68.4	58.5	78.2	57.3	1.6	42	3400	37.15	19.29	409.72	9	28
SANDS	SOI 2833RR	68.3	62.1	74.4	56.5	1.1	31	3480	36.66	19.62	405.70	9	25
KRUGER	287 RR	68.1	63.2	72.9	57.0	1.4	35	3040	38.91	19.61	422.56	9	26
SANDS	SOI 2953RR	67.8	65.5	70.1	56.4	1.4	31	3080	36.47	19.19	400.02	9	26
DYNA-GRO	D.G. 38K28	67.3	62.8	71.8	56.5	2.0	40	3260	36.62	20.02	401.78	9	26
BIO GENE	BG2801RR	67.0	62.3	71.6	57.8	2.1	40	3190	36.59	19.11	394.97	9	30
LG SEEDS	C2883RR*	66.8	62.0	71.5	56.2	1.5	34	3220	37.67	19.03	401.47	9	26
Average all entries	66.3	63.0	69.4	56.8	1.7	36	3269	37.10	19.50	397.19	9	27	
Difference req. for sig. 5%		4.5**	3.5	5.7	0.4	0.4	4	257	1.70	1.00	NS	NS	2

*Entered by UNL

**Top Grouping 67.0-71.5

Table II. Early Roundup Ready variety tests in Saunders and Clay counties, 2003. Entries represent the average of the two sites for each of the identified traits, except for *Yield* which includes entries for the average and for both sites. Results are grouped and shaded according to their Least Significant Difference (LSD). All varieties within a particular color grouping would be considered equal.

Brand	Variety	Yield			Bushel Weight	Plant Lodging	Plant Height	Grain Seed	Grain Protein	Grain Oil	EPVA	Maturity	
		Average bu/A	Saunders bu/A	Clay bu/A	lb/bu	Rating	Inches	/lb	Pct	Pct	$/A	MO	Day
TRIUMPH	TRX2J28RR	71.5	69.1	73.9	56.7	1.9	40	3200	35.65	19.39	415.42	9	25
KRUGER	289 + RR	70.9	67.1	74.7	57.3	1.2	35	3230	36.44	19.59	419.73	9	27
LG SEEDS	C9284RR ##	70.6	67.6	73.6	56.2	1.6	32	2990	36.92	19.10	418.31	9	27
KRUGER	322-2 RR	70.5	64.7	76.2	57.2	1.2	37	3210	36.24	19.66	416.66	9	27
LATHAM	E3140R	69.9	64.4	75.3	56.9	2.2	40	2950	37.78	19.04	420.80	9	29
DYNA-GRO	D.G. 31G30	69.8	68.2	71.3	56.5	1.5	31	3030	36.82	19.64	416.36	9	27
LATHAM	E2857R	69.8	63.4	76.1	57.0	1.9	42	3070	36.95	19.95	420.89	9	28
KRUGER	260 RR	69.6	64.9	74.3	58.4	1.6	35	3330	37.65	18.84	417.25	9	25
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NUPRIDE	8294RR	69.0	64.5	73.4	56.6	1.9	41	3230	36.40	19.58	409.17	9	26
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TRISOY	2933RR	68.7	67.7	69.6	56.2	1.6	31	3020	36.47	19.72	407.73	9	27
SANDS	SOI 2872RR	68.7	64.1	73.2	56.4	1.8	40	3260	37.26	20.10	415.98	9	25
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BIO GENE	BG2801RR	67.0	62.3	71.6	57.8	2.1	40	3190	36.59	19.11	394.97	9	30
LG SEEDS	C2883RR ##	66.8	62.0	71.5	56.2	1.5	34	3220	37.67	19.03	401.47	9	26
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Difference req. for sig. 5%		4.5	3.5	5.7	0.4	0.4	4	257	1.70	1.00	NS	NS	2
Groups	1	71.5-67.0	69.1-65.6	78.2-72.5	58.4-58.0	1.1-1.5	31-35	2950-3207	39.73-38.03	20.17-19.17			
	2	66.9-62.4	65.5-62.0	72.4-66.7	57.9-57.5	1.6-2.0	36-40	3208-3465	38.02-36.32	19.16-18.16			
	3	62.3-57.8	61.9-58.4	66.6-60.9	57.4-57.0	2.1-2.5	41-45	3466-3723	36.31-34.61	18.15-17.15			
	4		58.3-54.8	60.8-55.1	56.9-56.5	2.6-3.0							
	5				56.4-56.0								
	6				55.9-55.5								

Table III. 2003 soybean yields - YOURFARM, NE.

Brand	Variety	Acres	Yield (bu/a)	Adj. Yield	Lodging	Adj. Lodging	Grain Protein	Adj. Grain Protein
Bob's Best	ABCDRR	150	73		2.3		36.8	
Len's Leanest	1234RR	50	69		1.5		33.2	
Kruger	322-2 RR	200	61		1.9		34.7	
Roger's Rogues	zyxwRR	400	62		1.6		34.2	
Sands	SOI 2953RR	200	57		2.0		35.4	

Table IV. Common varieties grown on your farm and in UNL trials. 2003 soybean yields - YOURFARM, NE

Brand	Variety	Acres	Yield (bu/a)	Adj. Yield	Lodging	Adj. Lodging	Grain Protein	Adj. Grain Protein
Bob's Best	ABCDRR	150	73		2.3		36.8	
Len's Leanest	1234RR	50	69		1.5		33.2	
Kruger	322-2 RR	200	61	71	1.9	1.2	34.7	36.2
Roger's Rogues	zyxwRR	400	62		1.6		34.2	
Sands	SOI 2953RR	200	57	68	2.0	1.4	35.4	36.5

Table V. 2003 soybean yields - YOURFARM, NE. Adjustments for yield, lodging, and grain protein.

Brand	*Variety*	*Acres*	*Yield (bu/a)*	*Adj. Yield*	*Lodging*	*Adj. Lodging*	*Grain Protein*	*Adj. Grain Protein*
Bob's Best	ABCDRR	150	73		2.3		36.8	
Len's Leanest	1234RR	50	69		1.5		33.2	
Kruger	322-2 RR	200	61	71	1.9	1.2	34.7	36.2
			+10		**-0.7**		**+1.5**	
Roger's Rogues	zyxwRR	400	62		1.6		34.2	
Sands	SOI 2953RR	200	57	68	2.0	1.4	35.4	36.5
			+ 11		**-0.6**		**+1.1**	
Adjusted Factor				**+10**		**-0.6**		**+1.3**

Table VI. 2003 soybean yields - YOURFARM, NE

Brand	*Variety*	*Acres*	*Yield (bu/a)*	*Adj. Yield*	*Lodging*	*Adj. Lodging*	*Grain Protein*	*Adj. Grain Protein*
Bob's Best	ABCDRR	150	73	**83**	2.3	**1.7**	36.8	**38.1**
Len's Leanest	1234RR	50	69	**79**	1.5	**1.0***	33.2	**34.5**
Kruger	322-2 RR	200	61	71	1.9	1.2	34.7	36.2
			+10		-0.7			
Roger's Rogues	zyxwRR	400	62	**72**	1.6	**1.0***	34.2	**35.5**
Sands	SOI 2953RR	200	57	68	2.0	1.4	35.4	36.5
			+11		-0.6			
Adjusted Factor				+10		-0.6		+1.3

*Lodging scores start at 1.0.

Table VII. 2004 soybean variety list.

Soybean Brand	*Variety*	*Acres*	*Notes - Comments*

in the same way (*Tables V and VI*). These adjustments allow us to compare "YOURFARM" data to NU test results.

You are now ready to make your selection for next year. Compare your information directly to the NU yield trial information using the adjusted values. Remember to select varieties with different characteristics to assure greater diversity. In this example, you might select Bob's Best and Len's Leanest. These are the two varieties with the highest adjusted yields and there is a large difference in their adjusted lodging values. Record your hybrid selections in *Table VII* and consider including two or three new varieties on a few acres next year, based on comparisons with the NU results.

A companion publication to this NebGuide, *Using Soybean Variety Yield Data to Improve Selection of Varieties Part I (G1546)*, describes soybean variety traits and how each contributes to production and yield. It is available from your area University of Nebraska–Lincoln Extension Office or online at the Institute of Agriculture and Natural Resources Publication Web site. The results from the University of Nebraska crop variety trials are available online at *varietytest.unl.edu*.

This publications has been peer reviewed.

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