AGRONOMIC Spotlight

Technology Development & Agronomy by MONSANTO

Interpreting Yield Results - Data Evaluation and Statistical Measurements

- Yield trial results offer an opportunity to compare agricultural products in a geography similar to one's own farm and can assist growers in selecting quality products for next season.
- As yield results are examined this fall and winter, keep in mind to evaluate multiple locations and scenarios, evaluate head-to-head comparisons, consider the statistical differences, and be aware of any differences that may not be related to the seed products.

Evaluate Multiple Locations

Data from a single plot location near one's farm is only one snapshot of performance, and may not provide a complete picture of product potential. Products may yield well at one location and poorly at another. Weather, insect pressure, and fertility are just a few variables that can affect product performance across locations. Therefore, evaluation across multiple locations allows the greatest opportunity to get an accurate picture of performance and consistency. If there is data available, an evaluation of product performance across years is also beneficial.

Evaluate Multiple Scenarios

Field management can also affect product performance. Take a look at the field history. When was the field planted? What was the crop rotation? How much tillage was involved? Was a soil insecticide used? How were weeds controlled? What traits were in the seed and how did they contribute to yield?

Seek Head-to-Head Comparisons

When trying to determine if one product is superior to another, compare the product not just at one plot, but many. You may find that one product consistently outperforms the other.

In large plots with many entries, it may be tempting to compare two products in the same plot. However, if Product A is entry #3 and Product B is entry #15, it may not make sense to compare the two when they are located so far from each other in the plot. If periodic "check" strips are planted in a field, it is better to compare each product to the nearest "check". A "check" product is to be used as a reference in comparing the yields of products that are in close proximity to it. The purpose of the "check" is to provide a relative measure of performance in that general area of the field. When the check is yielding well, you would expect neighboring products to also respond closer to the higher end of their yield potential. Conversely, if a check is not performing well, the neighboring products would be demonstrating their yield potential within that non-optimal part of the field. Another good practice is to plant and harvest a second replication of the products you are trying to compare.

Statistical Differences

"Statistical differences" signify that the results are unlikely to have occurred by chance and have a high probability of repeating themselves. If yields are not determined to be statistically significant, it indicates that the differences due to seed products are not large enough relative to the experimental variation in the field. Plot results may include an LSD, which stands for least significant difference. This numerical value is usually listed at the bottom of yield tables. Differences among varieties are significant only if they are equal to or greater than the LSD value. For example, if the LSD value is 10, and Product A yielded 12 bu/A greater than Product B, then Product A had a significantly higher yield at that plot location (Figure 1). If the LSD is 10, and Product C yielded 7 bu/A greater than Product B, then they are not statistically different in yield at that location (Figure 1).

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Example of Least Significant Difference and Coefficient of Variation

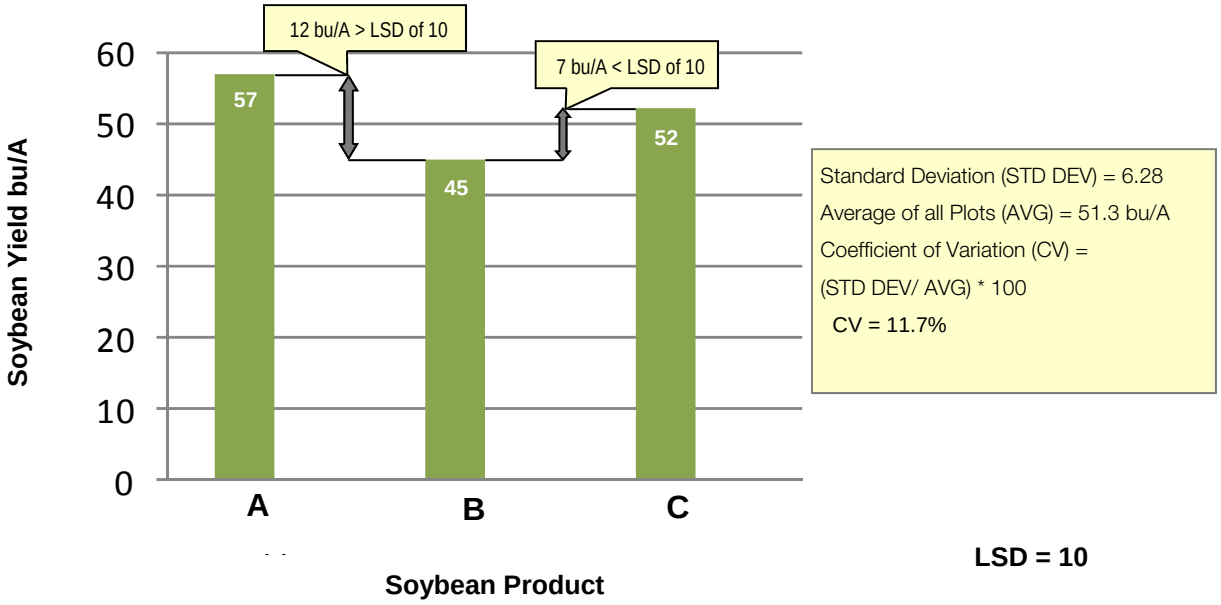

Figure 1. Difference in yield between Product A and B is 12 bu/A. Since this is greater than the Least Significant Difference of 10, the yield difference is SIGNIFICANT and is NOT likely to be due to experimental variation in the field, but to genetic differences. Difference in yield between Product C and B is 7 bu/A. Since this is less than the Least Significant Difference of 10, the yield difference is NOT SIGNIFICANT and IS likely due to experimental variation in the field and not genetic differences. The Coefficient of Variation from this test is 11.7%. A CV $\leq$ 15% is desired and the closer it is to zero the lower the amount of variability in the data.

Additionally, plot results may include a coefficient of variation, or CV. This value refers to the magnitude of experimental variability relative to the mean, usually reported as a percentage (Figure 1). A high CV indicates that there is excessive experimental variability, leading to less precise estimates of yields of seed products. A low CV normally results from a more uniform plot location. In field test results, a CV of 15% or less is desired and the closer the CV is to zero, the higher the quality of data from that test.

Identify Differences not Related to the Seed

Plot results may include differences in yields that can come from variations across a plot test site. These differences could include drainage, previous crop, fertility and compaction. Care should be taken to identify how much of the yield variations reported may be attributed to these other field factors not related to the seed choices.

In summary, yield trials can provide growers with important information that can help select quality agricultural seed products for the next season. The following are good suggestions:

- Evaluate Multiple Locations to help achieve the most accurate look at product performance and consistency.
- Look at Field History. Management practices such as tillage or weed control may have had an effect on overall performance.
- Seek Head-to-Head Comparisons.
  - Compare products at multiple locations.
  - If applicable, compare each product to the nearest "check" product in close proximity to it.
- Consider Statistical Differences and Reliability.
  - Least Significant Difference (LSD) is a value used to determine if plot values are statistically different.
  - Coefficient of Variation (CV) is a value used to determine how reliable a data set may be.

For additional agronomic information, please contact your local representative