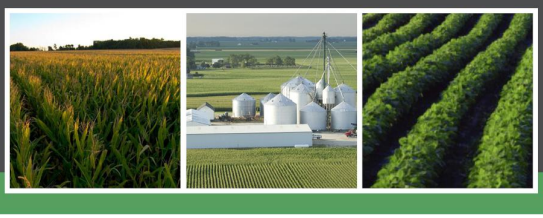

Agronomic Spotlight

How to Establish Effective Side-By-Side Comparisons

- A side-by-side (on-farm) testing plot is a head-to-head yield and agronomic comparisons in farmers field conditions and under their management practices.
- Statistical data analysis can determine whether differences in yield are due to experimental variations in the field or differences between products. This can be helpful in selecting the best product for planting the following year.
- Successful on-farm comparisons take time, effort, good planning, monitoring, and accurate note taking during the growing season.

Layout of Plots and Planting

Before going to the field, a test plot requires thorough planning. Field topography, product selection, harvest equipment, and replications are important variables that should be considered during the layout of a successful side-by-side testing plot.

Field Topography and Planter. If a yield monitor will be used to map results, the plot should be planted perpendicular to changes in soil type, slope, and other field conditions so that yield can be compared as the products transition from one environment to another. If the right equipment is not available or you are more interested in the general differences, then fields with variable soil types, slopes, irregular boundaries, and tile lines running parallel with the rows should be avoided. Longer, field-length strips are preferred to reduce variability in the test. Border rows should be included on each side of the plot to avoid edge effects. The split-planter comparison method works well for a side-by-side plot.

A split-planter comparison can be easily established by randomly placing a different seed product in each half of the planter. Care should be taken to ensure that seeding rates and planter adjustments are appropriate to achieve the same stand for each product on both sides of the planter. In addition, the planter box should be thoroughly cleaned before loading the next product.

Product Selections. When selecting corn or soybean products, try to keep the comparison within plus or minus two days relative maturity (RM) for corn and 0.2 RM for soybean.

Harvest Equipment. In corn, the width of the combine header should be one-half the planter width. In soybean, plant strips twice as wide as the combine header so that the center of the plots can be harvested.

Randomization and Replications. The key to an on-farm test is that it must be repeated in unbiased side-by-side comparisons of the products in question. Randomizing and replicating are important for planning a scientifically valid plot. This is what separates a demonstration plot from one that can be used to make valid recommendations/conclusions. To adequately compensate for field variations, each pair of the compared products should be replicated at least four to six times. In addition, treatments should be randomly located within the pair. Where applicable, the appropriate refuges should be planted as outlined in the IRM guide.

Collecting Notes and Data Throughout the Season

Plots should be monitored frequently throughout the season and all crop inputs should be recorded. Notes taken during the growing season can be very useful during data analysis to provide insight on variances that may be present.

Important observations that should be recorded include: seedling emergence patterns, early-season vigor, plant standability, plant height, weed control, insect damage, soil and weather conditions, drought tolerance, staygreen, and drydown. These observations are very valuable to inform the farmer how the products are performing and if there is a problem that can be addressed early on.

Prior to Harvest. It is important to walk a few strip plots before harvest to observe product differences. Corn ear size uniformity should be checked for length and girth. A simple push test should be performed to evaluate stalk quality in both products. Any root lodging should be noted as well.

Significant differences in soybean standability for each product should be evaluated. Also, each product should be assessed for any late-season diseases that may have affected one product more adversely than another. Observe and note any seed shattering and green stems while scouting.

During Harvest. All equipment used in harvest data collection such as moisture meters, weigh wagons, and yield monitors should be accurate and well calibrated. Combine yield monitors, moisture sensors, and vibration sensors should be calibrated for the grain conditions of the field being harvested. Settings should be recorded and notes made of any changes for future reference.

In addition to yield data, notes about plant intactness, standability, tissue health, and ease of harvest should also be recorded.

When harvesting a split-planter comparison with a yield monitor, grain harvested from each seed product should be identified as a specific “load”. Use of a well calibrated weigh wagon or certified scale is recommended to help assure proper yield monitor calibration.

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For additional data collection for yield calculations when using a weigh wagon, see Table 1. Plot yield mapping can provide even more information as products may differ within strips due to soil type, topography, or past management practices.

Table 1. Calculating yield corrected for moisture.
Corn bushel adjusted to 15.5% moisture **Bushels of corn at 15.5% moisture = Total harvested grain weight (lbs) x (1.0 minus % moisture)** **47.32 (lbs of dry matter in a bushel of 15.5% moisture corn)**
Soybean bushel adjusted to 13.0% moisture **Bushels of soybean at 13.0% moisture = Total harvested grain weight (lbs) x (1.0 minus % moisture)** **52.2 (lbs of dry matter in a bushel of 13.0% moisture soybean)** **(Acre = 43,560 square feet)**

Analyzing Data

Many on-farm comparisons are required to determine with confidence that a statistical difference exists between two products. The more data replicated and analyzed, the better the confidence level in picking a winning product.

In addition, comparing data with results from similar trials in other locations can be beneficial to help substantiate the data collected. The best conclusions are usually drawn from trial results that are conducted in more than one location and include more than one year.

When comparing two products in a yield trial, statistical analysis can help determine if differences are due to product superiority or field variability such as weather conditions, insect pressure, soil conditions, and/or management.

Plot yields in a side-by-side trial are compared by using a paired t-test. The test is used to show if the yields of two sets of treatments (i.e. corn products) are significantly different. Yield difference between the two treatments are used to compute a t-value, which is declared significant only if it is greater than a critical value at the 5% probability level. The critical value is the minimum expected difference between the two products, and the probability level indicates a confidence of 95% that the observed difference is not happening by chance. In other words, we are 95% confident that the observed difference occurred due to product superiority. For example, product A yielded 100 bu/acre and product B yielded 160 bu/acre; if the calculated t-value was higher than the critical value then product B is statistically significant from product A and the experimental treatment (i.e. corn product selection) has an effect on the yield. Computed t-values and probabilities are sometimes listed at the bottom of a yield table or in the plot results. Yield differences that are not statistically significant indicate that the differences are more likely due to experimental variations in the field, rather than differences between products.

The performance of any seed product is the result of the combined effects of genetics and respective environment. No product can win every yield plot or test. Industry-leading products have a head-to-head winning percentage of 60 to 65%, over many locations.

Summary

Side-by-side replicated test plots compare current and new products, technologies, and management systems. Results from replicated tests, conducted under variable conditions, are more reliable than non-replicated tests. In addition, replicated tests conducted in more than one location and across more than one year are likely to provide data with a much better confidence level than one-year, single plot trials.

Results are sometimes statistically analyzed to determine if differences between treatments are due to seed products or the experimental variation in the test plot. Therefore, on-farm yield data can illustrate how seed products respond to producer's management practices and can serve as an aid in next year's seed selection.

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For additional agronomic information, please contact your local seed representative.