

Suggestions for Producers Considering Yield Monitor Data Analysis

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The percentage of farmers outfitted with combine yield monitors is increasing at a dramatic pace. USDA-ARMS surveys indicated that 29% of 2002 U.S. soybean acres and 37% of 2001 U.S. corn acres were harvested with a combine equipped with a yield monitor—2004 harvest estimates place that number now close to 50%. With substantial numbers of farmers collecting site-specific yield data, demand for spatial analyses and on-farm experimentation is increasing. Planned comparison yield information can now be collected on the go, as compared to the days of hauling separate loads to a scale or dumping into a weigh wagon. Tied to a GPS receiver, yield monitors also facilitate analysis of spatial patterns of crop yields.

Yield monitor data from on-farm planned comparisons was analyzed this year as a new feature of Purdue University's Top Farmer Crop Workshop (TFCW). Data from four farms was examined to determine if there were significant differences in hybrids and varieties across varying soil types, slope aspects, and management practices.

Yield monitors generate huge amounts of data, and working with this volume of information is no easy task. This is further complicated by the types of planned comparisons, and specific questions asked by each producer. Because every production situation is different from field to field and farm to farm, the layouts for planned comparisons are equally diverse. Experiences gained from the 2004 TFCW show that producers interested in analyzing planned comparisons in particular, and yield monitor data in general should consider the following to facilitate analysis:

- Keep good records of field locations. Flags, stakes, or other physical landmarks can be used to mark planting locations or treatments applied, and are convenient if you want to return to observe or take notes during the growing season. Also record locations on paper, on laptop computers or hand-held devices. Or, consider using GPS to mark coordinates while working on planters, sprayers, or ATVs. At harvest, use the load option of the yield monitor to log various comparisons. These field records not only ensure correct information but help others who perform your analysis better understand your comparisons.
- Ensure there is a planned comparison. If there are no comparisons between, for example, varieties, tillage techniques, or dentrification inhibitors (versus using none), then it is not possible to make any kind of generalization about which treatment works best in any given situation. Blocks of 15 to 25 acres have worked well for several growers. Many growers are anxious to have yield monitor data analyzed when yields were produced under uniform input applications. This type of statistical data mining is not yet mature enough to be used in practice. However, new techniques in statistics that model spatial effects are especially useful for analyzing 'spatially dense' data, like yield monitor data.

- Make sure treatment blocks cover a diverse topography. A treatment block is an area where one treatment is applied. For example, a treatment block might be placed over two or more soil types, over portions of the field exhibiting different levels of organic matter or electrical conductivity, or across north-facing and south-facing slopes (**Figure 1**). Furthermore, treatment blocks might be based on a producer's intimate knowledge about the production characteristics of a field. This way, how treatments respond in physically different parts of the field can be measured. For example, it may be that a given variety performs very well on some soils, and not so well on others. Intimate knowledge of the field can help with the analysis and interpretation of results.
- Choose treatments wisely. Rate trials are very informative, but require more planning, work, and risk for the grower. To correctly conduct rate trials, very low or zero rates and very high rates above what plants normally need are required to provide an adequate range of values. Good comparisons might include variety studies, herbicide comparisons, or pre-plant vs. mid-season fertilizer application.
- Raw yield data is preferable. Yield monitor data that have been converted to industry standard file formats (for example, database [*.dbf] or text [*.txt] extensions) are easily imported into all personal computers.

When selecting fields for comparisons, keep in mind that past practices can introduce variables that may affect results and lead to erroneous conclusions. For producers considering planned comparisons, some important questions need to be asked even before the design and implementation of the experiment. Understanding of field management history is essential:

1. Have past inputs been managed uniformly over the field chosen for the experiment?
2. What is the crop history on the site? Has continuous corn been planted on part of it and a corn/soybean rotation on the other?
3. Have there been livestock lots or pasture on the field? Has manure been recently applied?
4. Were there old home places, barns or tractor sheds? Sink holes at one point?

The above information is important to consider during analysis. Accuracy of statistical results is improved when field management history is included in the analysis. For more information on yield monitor data analysis, please see the Top Farmer Crop Workshop at <http://www.agecon.purdue.edu/topfarmer>

Figure 1: Example of soil property spanning across all three treatment blocks

