

USING SITE-SPECIFIC TOOLS TO MANAGE FIELD-SCALE RESEARCH

By Jeff Boyer, Bruce Erickson, and Stephen Hawkins

New tools are helping researchers find new ways of answering crop management questions. Equipment linked to global positioning systems, variable rate applicators, field-ready scouting tools, and related software are helping researchers harvest meaningful information from field scale plots. What is learned could help not only the researchers in their studies, but help farmers collect meaningful information and answer key management questions on their own farms.

On-farm research has long been regarded as more authentic, but less consistent, less controllable, and less reliable than the replicated, small plot testing that has been the centerpiece of much company and university agronomic testing. But some types of research questions are not best addressed in small plots. Studies comparing responses where the effects may extend beyond a typical 4-row by 20-foot plot, such as responses among soil types, drainage, crop rotations, tillage, large-scale equipment effects, or effects over a period of years may require larger field blocks. Also, many farmers are naturally skeptical of the information coming from small plots, mainly because they appear to be managed somewhat differently than their own fields.

With global positioning system (GPS) technology, researchers can collect information and easily navigate a return visit to specific field locations in large plots without depending on field markings. Treatments can be applied, and inputs changed on the fly. At the Davis/Purdue Agricultural Center (DPAC) near Farmland, Indiana, OmniSTAR[®] differential correction (DGPS) is employed to increase positional accuracy. An AgLeader[®] PF3000 Pro monitor, Rawson ACCU-RATE Drive, and a Midwest Technologies (Mid-Tech[®]) controller are used to manage inputs on field equipment that includes a John Deere 750 drill, Deere 7200 planter, AG Systems Liquid fertilizer applicator, Valmar Airflo[™] fertilizer spreader, a Chandler lime spinner spreader, two tractors and a combine. With equipment such as this, large plots



The Rawson Accu-Rate controller enables variable rate applications on planters and with Valmar Airflo[™] fertilizer application equipment (images courtesy DPAC staff).

comparing different planting rates, fertilizer rates, or herbicide treatments can be established without stopping and starting equipment across the field, or cutting the field up into small blocks to test each treatment.

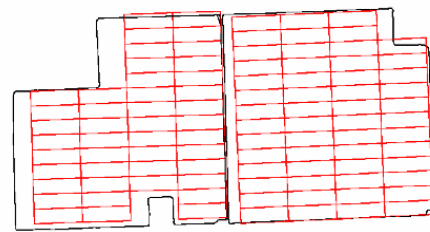
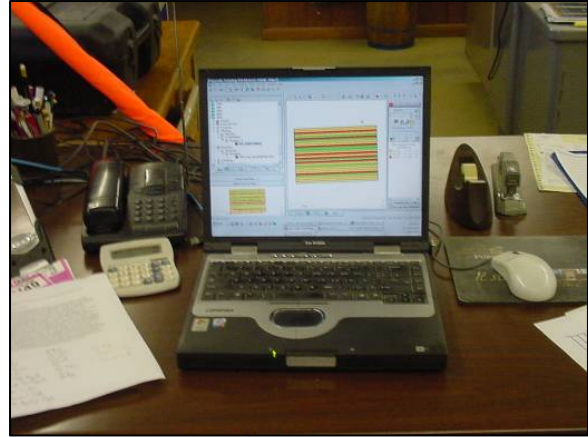
In small plot research, the close proximity among plots minimizes differences in soils or other natural or man-made features that may occur across a field. Treatments are replicated and randomized, and experimental errors calculated from the variation that is seen among plots treated similarly. In farm-scale blocks, replication and randomization are still very useful, but error can also be accounted for by using information on field characteristics as co-variates. This might include soil characteristics, soil tests, and past management practices.

At DPAC, an iPAQ handheld computer linked to a Navman GPS receiver is used for field scouting and in-season data collection. Data entered into the iPAQ can then be integrated into the site-specific record-keeping system, as well as yield data at harvest.

To keep field history data, generate plot plans, and implement field treatments the commercially-available software SMSTM Advanced, ArcView, and Farm Works[®] are utilized. This geographic information system (GIS) software allows users to store, retrieve, adapt, and manipulate site-specific data from fields. For instance, crop yields or moisture can be correlated with other information collected in the field, such as soil mapping unit or drainage information. High-speed data transmission lines allow for rapid transfer of information to end users on campus or around the state.



A Chandler spinner spreader with a Mid-Tech controller is used to apply variable rate lime.



Software is utilized to manage field history data, generate plot plans and export prescription data files to be used in application equipment in the field.

The site-specific approach at DPAC is used both before initiation of a study, and in the accounting of field errors upon completion of the work. Utilizing detailed field records, plots and treatments are laid out to minimize field variability not associated with the treatment. The research station staff are more familiar with the field areas and can help the researcher manipulate plot layout prior to establishment.

Execution of the plot layout and treatments rely heavily on all components of the system, but farm staff can still manipulate field machinery manually if there is an electronic malfunction. The precision technology approach focuses more attention to planning, allowing researchers to concentrate efforts on measuring parameters of interest during the growing season.

Site-specific record-keeping began at DPAC in 1995 with the collection of yield data using Ag Leader's AL2000 yield monitor and Rockwell's Vision system. Large plot research was implemented beginning in 2003 at DPAC for

one researcher and is now being utilized at three agricultural centers with five researchers working in corn, soybean, weed and nutrient management.

Since the site-specific techniques have been implemented, researchers working at DPAC are more confident in the quality of the research conducted there. Research station staff are more efficient in the application of treatments to large plots, and are able to be more responsive to researcher needs. The result is that the system has greatly enhanced the use of relatively large fields for the collection of good quality research data.

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An Ag Leader PF3000 monitor allows not only the collection of yield data but also the use of the monitor for controlling variable rate application equipment