Electronic Tools for Field Scouting

By Mike Thurow

Growing conditions are seldom stable or consistent from year to year, and that makes it challenging to know what factors really contributed to in-field yield variations. New, practical and affordable technologies exist that can tell you more. These new electronic field diagnostic tools fall into the following categories: nutrient management tools; weather instruments; and soil quality tools.

New electronic field diagnostic tools are being developed for use in nutrient management, weather monitoring, and gauging soil quality. But they will not eliminate the importance of someone walking crop fields to scout conditions.

Nutrient Management Tools

The lack of on-the-go soil sensors for nutrient management remains an important void in precision or site-specific agriculture. While research and development continue, it is doubtful that soil nutrient sensors for the field will be commercialized before the turn of the century. What's taking so long? It is difficult to achieve accurate and consistent soil analysis from a laboratory at zero miles per hour, so how can we expect to do accurate nutrient analysis with a soil sensor moving through the field at 5 miles an hour? However, there are practical and affordable tools that can provide valuable feedback on key soil nutrient parameters.

No other soil chemical property has such a profound effect on fertilizer efficiency or soil nutrient availability as soil pH. On-farm soil pH testing can be performed easily and accurately. Meters are affordable (about $150.00), reliable, and approach laboratory accuracy. The typical process itself involves mixing soil and distilled water in a cup, allowing the sample to equilibrate for 5 to 10 minutes and immersing the sensor into the soil slurry and waiting a few seconds for the meter reading to stabilize.

Several tools for infield nitrogen (N) soil and tissue analysis are available today. The Minolta Chlorophyll Meter is an example. Minolta developed this technology in the early 1980s as an N management tool for rice growers. The current model (SPAD 502) was introduced in 1987. University research shows a strong correlation between the meter's leaf chlorophyll measurement and leaf N content. Furthermore, University of Illinois researchers found a strong correlation between corn leaf chlorophyll readings at the reproductive stage and final yield. The higher the SPAD meter reading, the higher the yield.

Creating adequately fertilized reference or check strips within the field is important to fully utilize this technology and monitor the N status of corn. Meter readings from the reference strips are compared to the bulk field to identify the need for additional N. The benefit of the reference strip approach is that corn hybrid and growth stage factors are eliminated. And

Use of a chlorophyll meter with GPS may help monitor N needs or yield as related to management.

additional N can be applied beyond the usual side-dress time with high clearance equipment or through pivot irrigation if necessary.

The value of this technology is now greatly enhanced with the optional RS 232 (a serial 25-pin connection for data transfer) port on the SPAD meter and the StarWALKER field data logger. This new wrist logger combines the SPAD chlorophyll measurement and differential global positioning system (DGPS) coordinates and stores the information in the robust data recorder for subsequent data transfer to a computer. This new technology is currently being beta tested.

Weather Monitoring Technology

Weather, particularly temperature and rainfall, directly impacts crop growth, quality and yield. Rainfall can vary from farm to farm and field to field, but to measure is to know. Rain data loggers can record daily rainfall and log detailed rainfall activity year round. If more weather information is needed, weather stations can measure solar radiation, wind speed and direction, temperature and humidity, soil temperature, and leaf wetness. Software can calculate degree-days, evapotranspiration, and create your own weather database for year-to-year comparisons and analysis.

Weather parameters can be tracked on a site-specific basis with data loggers for air and soil temperature, humidity, and light intensity. This affordable technology replaces expensive strip-chart recorders and interfaces with PCs for data analysis and storage.

Degree-day counters can electronically measure temperature and calculate heat units. They are ideal for growers that don't have a personal computer.

An essential integrated pest management (IPM) tool is an electronic leaf wetness/temperature logger which tracks leaf wetness duration and temperature as an aid in predicting gray leaf spot.

Soil Quality Tools

Just how beneficial is rainfall information if you can't measure what's in the soil? Soil moisture impacts plant growth and yield. Soil quality tools can shed more light on quantifying soil moisture and its variability by soil type and throughout a field. They are more useful when measurements are geo-referenced and analyzed in mapping software or even correlated with yield maps.

Soil compaction is an undisputed yield robber. But how much compaction is bad and how can it be measured more accurately? An electronic compaction meter is available with ultrasonic depth sensing technology. It measures probe insertion speed and warns the user if the speed is too fast. It also measures and logs compaction throughout the soil profile. The penetrometer has an RS 232 output and could be geo-referenced for mapping purposes.

Perhaps the greatest value of electronic field scouting tools is that someone is walking the fields. We use our own powerful resources: our eyes, knowledge and experience for observing and noting crop conditions. BC

Mr. Thurow is President of Spectrum Technologies, Inc., Plainfield, Illinois.