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In This Issue

Learning To Identify Plants Is A Worthy Skill

(Keith Johnson)

Plants are around us no matter where you live. I continue to be challenged with plant identification as an agriculturalist and enjoy learning to identify plants that are not in production agriculture, too. Too many of us learned how to identify poison ivy from the unfortunate contact we had with it on a hike or learned how to identify it from someone else that felt itchy discomfort. Some individuals have taken an interest in foraging out food resources in the great outdoors. They took time to learn what was edible, would cause a stomach ache, or even death if a plant or parts of a plant made it to their mouths and swallowed. One cannot be most effective in controlling a pesky plant in a field where there are desirable plants without identifying the pesky plant. Can the problematic plant be controlled with cultivation, or crowded out with proper fertilization and reduced grazing pressure? What herbicides will best control the weed without doing harm to the desired plants?

Early in my career, I would identify plants with library-type books, field guides and plant identification keys. When using a key, it is imperative that you learn plant morphology terms first or the key will have little value. Decades later, I still find these resource materials useful but there are abundant online resources and a few great apps that can help narrow down what the plant in question may be.

At the Purdue University Crop Diagnostic Training and Research Center there are over 40 large tile rings planted singly to common Midwest USA forages. Most impressive are the over 300 tile rings (by my guesstimate) that have a weedy-type plant in each ring. The hours of time taken by Diagnostic Training Center staff to manage the plants in the rings in a year are many; the value the rings give helping educate agriculturalists about plant identification and management is immense.

Many forage species at the Purdue University Crop Diagnostic Training and Research Center are used for identification education.

Purdue Crop Chat Episode 9, Preparing For Harvest

(Bob Nielsen) & (Shaun Casteel)

In the latest Purdue Crop Chat Podcast, Extension Corn Specialist Bob Nielsen and Extension Soybean Specialist Shaun Casteel review the September USDA Crop Production Report and discuss if Indiana has the potential to reach USDA's projections based on a very dry August and September.

They also discuss what issues you might run into this harvest season.

The Purdue Crop Chat Podcast is presented by the Indiana Corn Marketing Council and the Indiana Soybean Alliance. Tune in to the podcast link.

Yield Monitor Calibration: Garbage In,

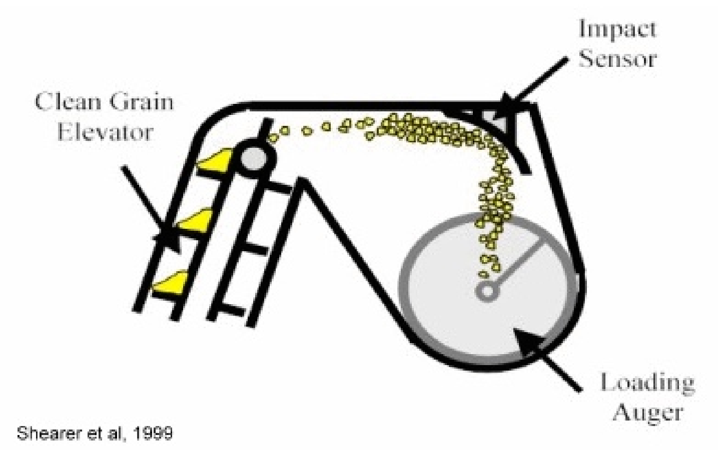
Garbage Out

(Bob Nielsen)

Understand this one simple fact about grain yield monitors: They do not measure grain yield.

How's that for an opening statement?

What I want you to understand is that yield monitors ESTIMATE yield by converting electrical signals received from a mass impact or optical sensor, located somewhere in the clean grain elevator of the combine, into ESTIMATES of grain flow (lbs) per second or two of travel time. Along with ESTIMATES of distance traveled (usually based on differentially corrected GPS signals), header width, and ESTIMATES of grain moisture content… the yield monitor's firmware / software then ESTIMATES "dry" grain yield per acre, at a moisture content of your choice, and records those yield estimates, and their geographic location in the field, every second or two in the display's memory or uploaded by cellular data connection to a Cloud-based Web server.



Yield monitor calibration involves a series of steps taken to ensure that the ESTIMATION of each of these factors is accurate. One of those steps involves the harvesting of calibration "loads" of grain that are used to "teach" the yield monitor's "black box" how to accurately convert the electrical signals from the sensors into ESTIMATES of grain flow rates.

Calibrating a yield monitor typically requires the harvest of individual "loads" of grain that represent the range of grain flow rates (i.e., a range of yield levels) you expect to encounter throughout the field. The amount of grain required for each calibration "load" ranges from 3,000 to 6,000 lbs (50 to 100 bu grain) depending on the manufacturer's recommendations for the specific model/make of yield monitor. The grain weight of each "load" is estimated "on the go" by the yield monitor as the grain is harvested.

The grain for each specific "load" is then offloaded from the combine grain tank and weighed on calibrated or "known to be accurate" weigh wagon or commercial scales. The actual weight for each load is then entered into the yield monitor console and the yield monitor firmware makes mathematical adjustments to the calibration response curve. Conceptually, the calibration process involves fitting a response curve between grain flow rate and flow sensor signal strength in order to estimate low, medium, and high yields. The nature of the calibration curve appears to differ among some makes of yield monitors.

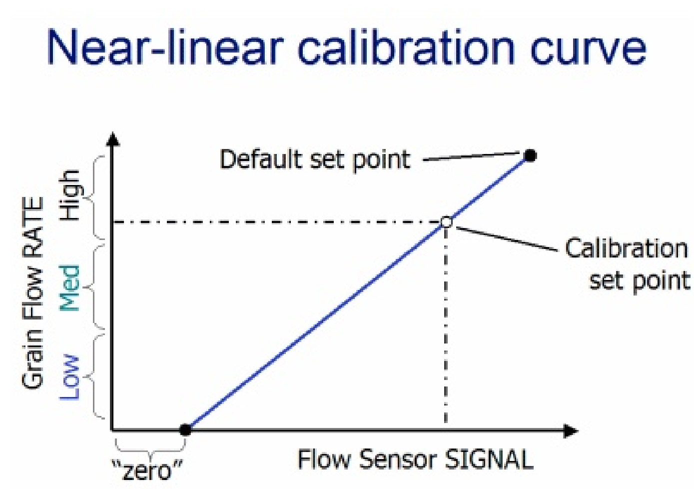
Some manufacturers suggest that only one grain load is necessary to perform an accurate calibration. That recommendation implies the calibration response curve is a straight-line or near-linear relationship between grain flow rates and flow sensor signals (see "Near-linear calibration curve" graphic below). While the standard recommendation is for only one grain load, the "fine print" in the owners' manual suggests that additional calibration loads may be added to fine-tune the accuracy when necessary.

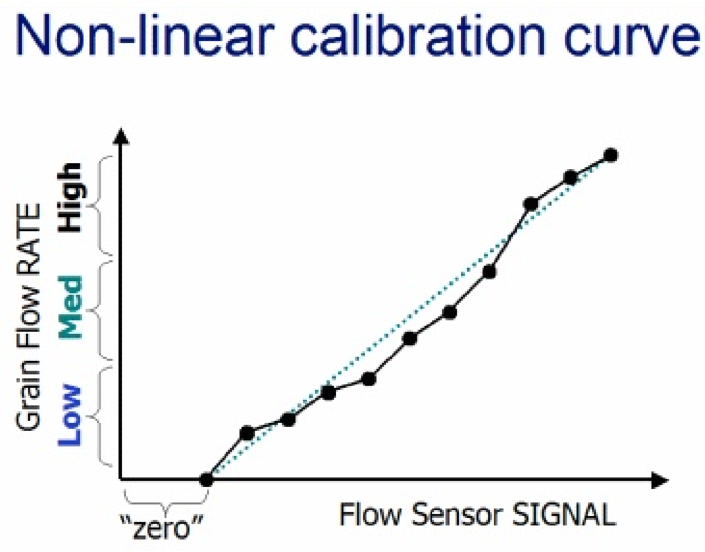
Other manufacturers recommend between 3 and 6 grain loads are required to perform a satisfactory calibration of the yield monitor. This recommendation suggests that the calibration response curve for these yield monitors is not a straight-line, but is rather some sort of non-linear response curve that requires a number of calibration points to best "train" the yield monitor how to interpret the flow sensor signals (see "Non-linear calibration curve" graphic below).

The goal with multi-load calibration procedures is to "capture" the full range of grain flow rates (aka yield levels) you expect to encounter when harvesting a field. When we harvest our field-scale corn research trials around the state, we typically aim to harvest calibration loads at speeds ranging from about half of normal to slightly faster than normal. With that range of speeds, our calibration errors are commonly 0.5% or less.

Capturing a range of grain flow rates during calibration can be a nuisance because it typically requires harvesting individual full header-width "loads" at different speeds or partial header-width "loads" at a constant speed. This headache plus the time it takes to off-load and weigh the individual grain loads are among the most common reasons why growers do not faithfully or routinely calibrate their yield monitors.

After all, some farmers tell me they can achieve low yield monitor calibration errors by harvesting all the calibration loads with a full header width at their usual combine speed. AND, I believe them! The problem is that by doing so, they have likely calibrated the yield monitor perfectly for a vary narrow range of yields. Unfortunately, the yield estimates for areas of the field yielding significantly lower or higher than where they calibrated will either be underestimated or overestimated because they failed to "teach" the yield monitor how to interpret the electrical signals from the mass sensor for those low and high grain flow rates.





Yield monitor accuracy can be excellent if the yield monitor is well-calibrated. Conversely, yield estimates can be very poor if yield monitors are not well-calibrated. The error in accuracy can be as much as 100 % if the yield monitor is taken "off the shelf" and put into service without any calibration. Errors in accuracy can easily range as high as 7 to 10 % late in harvest season if the yield monitor was calibrated only at the beginning of the harvest season because of changes in grain moisture content. Errors in yield estimates are especially likely if the full anticipated range of harvested grain flow rates are not included in the calibration of the yield monitor.

Well, you may ask… who cares whether or not your yield monitor is providing you with accurate yield estimates? After all, growers are typically paid at the point of sale according to the net grain weights printed on the scale ticket and not according to a yield map. Quite honestly, accurate yield monitor estimates also may not matter for simple farm record-keeping purposes.

However, if you want to USE the information that an accurate yield dataset provides, then you should strive to ensure accuracy in the yield estimates made by your yield monitor. Common uses for yield monitor data include comparisons of one field to another, one specific spot in a field to another, one hybrid's performance to another, early versus late harvest season, and experimental treatments in on-farm field trials.

Yield monitor calibration accuracy can be influenced by yield levels outside the range of grain flow rates used for the yield monitor calibration, by seasonal changes in temperature, by seasonal changes in grain moisture content, by hybrids in terms of their differences for grain weight, grain shape, and grain moisture, and by field topography. Calibrating your yield monitor once a season will not assure that it remains accurate the entire season. Check the accuracy of the yield monitor calibration occasionally by harvesting and weighing additional calibration loads. Recalibrate the yield monitor when necessary to maintain an acceptable accuracy.

Don't forget to…

- Also calibrate the combine's grain moisture sensor.
- Also calibrate for the zero-flow combine vibration.
- Also calibrate the temperature sensor at the beginning of the season.
- Re-read the yield monitor operations manual prior to the harvest season.
- Create a pre-season and in-season yield monitor checklist of all adjustments and settings.
- Go through the yield monitor checklist every morning before beginning the day's harvest.

Bottom Line

Yield data can be very useful for identifying and diagnosing yield influencing factors in corn or soybean. Yield monitors can also be useful for harvesting on-farm research trials. Yield monitor calibration, yield data processing, and yield data "cleaning" are necessary to ensure accurate yield data.

The bottom line is that extra care and attention to details are important when calibrating yield monitors. Dig out that users guide for your yield monitor system NOW. Before the end of summer, devote some quality time to reading the sections on yield monitor calibration. Familiarize yourself with all aspects of yield monitor calibration. Attend a yield monitor workshop. Create your own checklist of calibration steps and follow them faithfully every time you calibrate the monitor. Do not forget the little things like vibration settings, header height stops, offset of the DGPS antenna, etc. Recognize that accurate weighing devices (grain carts, weigh wagons, farm scales) and moisture meters are crucial for the calibration of the monitor's wet weight estimates and adjusting the combine's moisture sensor readings.

And remember the old adage about computers: "Garbage in equals garbage out".

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Converting Wet Corn Weight To Dry Corn Weight

(Bob Nielsen)

Corn is often harvested at grain moisture contents higher than the 15% moisture typically desired by grain buyers. Wetter grain obviously weighs more than drier grain and so grain buyers will “shrink” the weight of “wet” grain (greater than 15% moisture) to the equivalent weight of “dry” grain (15% moisture) and then divide that weight by 56 to calculate the market bushels of grain they will purchase from the grower.

The two sources of weight loss due to mechanical drying are 1) the weight of the moisture (water) removed by the drying process and 2) the anticipated weight loss resulting from the loss of dry matter that occurs during the grain drying and handling processes (e.g., broken kernels, fines, foreign materials). An exact value for the handling loss, sometimes called “invisible shrink”, is difficult to predict and can vary significantly from one grain buyer to another. For a lengthier discussion on grain weight shrinkage due to mechanical drying, see Hicks & Cloud, 1991.

The simple weight loss due to the removal of grain moisture represents the greatest percentage of the total grain weight shrinkage due to drying and is easily calculated using a handheld calculator or a smartphone calculator app. In general terms, you first convert the “wet” weight (greater than 15% moisture) to absolute dry weight (0% moisture). Then you convert the absolute dry weight back to a market-standard “dry” weight at 15% grain moisture.

Concept:

1. The initial percent dry matter content depends on the initial grain moisture content. For example, if the initial grain moisture content is 20%, then the initial percent dry matter content is 80% (e.g., 100% – 20%).
2. If the desired ending grain moisture content is 15% (the typical market standard), then the desired ending percent dry matter content is 85% (100% – 15%).
3. Multiply the weight of the “wet” grain by the initial percent dry matter content, then divide the result by the desired ending percent dry matter content.

Example:

1. 100,000 lbs of grain at 20% moisture = 80,000 lbs of absolute dry matter (i.e., 100,000 x 0.80).
2. 80,000 lbs of absolute dry matter = 94,118 lbs of grain at 15% moisture (i.e., 80,000 / 0.85).
3. 94,118 lbs of grain at 15% moisture = 1681 bu of grain at 15% moisture (i.e., 94,118 / 56).

One take-home reminder from this little exercise is the fact that the grain trade allows you to sell water in the form of grain moisture… up to a maximum market-standard 15% grain moisture content (or 14% for long term storage). Take advantage of this fact and maximize your “sellable” grain weight by delivering corn grain to the elevator at moisture levels no lower than 15% moisture content. In other words, if you deliver corn to the elevator at grain moisture contents lower than 15%, you will be paid for fewer bushels than you otherwise could be paid for.

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Editor: Tammy Luck | Department of Entomology, Purdue University, 901 W. State St., West Lafayette, IN 47907