CLEMSON
PRECISION AGRICULTURE

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Guide for Grain Yield Monitor Calibration

Hollens Free—Extension Precision Ag Associate

Yield monitors are the second most commonly applied precision agriculture technology. They are, for the most part, standard equipment on new grain combines. Properly calibrating a yield monitor is extremely important depending on how the data is going to be used. If all that the yield data is going to be used for is to compare relative differences within a field then the default calibration will probably be suitable, but if management decisions such as making prescription maps are going to be based on yield data then a proper calibration must be completed. It is also necessary to perform a proper calibration if profit maps are going to be generated from the yield data.

There is much more to obtaining a proper calibration then just obtaining the actual weights of a few random loads of grain. It is very important that the combine is operating properly during calibration. If the combine is not working properly during calibration and the problem is fixed during the harvest season then the calibration that was made may not be appropriate after the problem is fixed. It is important to make sure that the yield monitoring system is set up properly and that all the necessary components; header height sensor, shaft speed sensor, and mass flow sensor, are working as they should. Because of this it is suggested that the first few loads of the season not be used for calibration so that these items can be observed to make sure that all systems are running properly.

There is literature suggesting that only 3-5 loads of 3,000 lbs each are needed to perform a calibration. While this may generally be acceptable, it is necessary to make sure that the calibration loads cover the full spectrum of mass flow rates that will be encountered during harvest and greater confidence can be established in the calibration by replicating the mass flow rates. Imposing different mass flow rates can be accomplished by harvesting loads of irrigated versus non-irrigated crop or by simply varying the travel speed during calibration.

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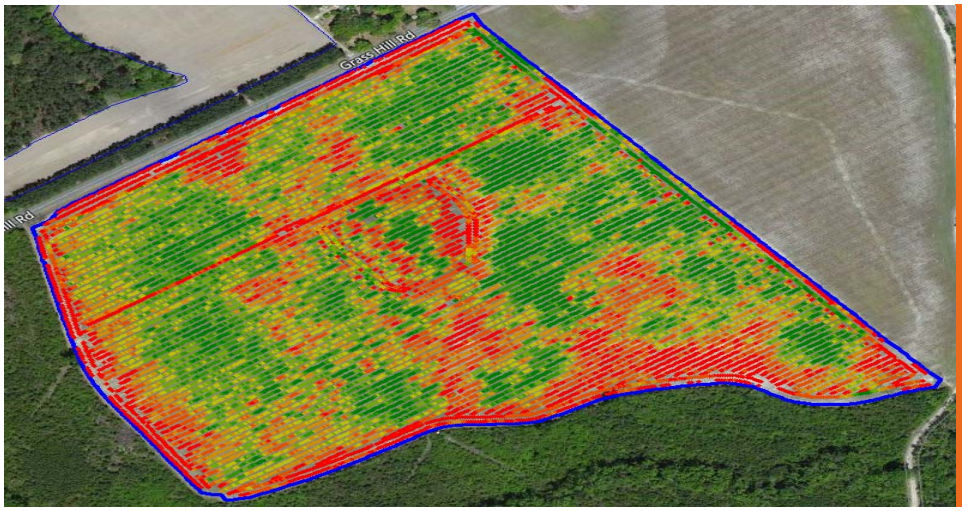

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Calibration cont.

In the case of calibrating a yield monitor more loads will generally provide a more representative calibration and the loads should be as large as possible, within the limits of the weigh wagon used; most weigh wagons can comfortably hold 5,000 lbs. of grain.

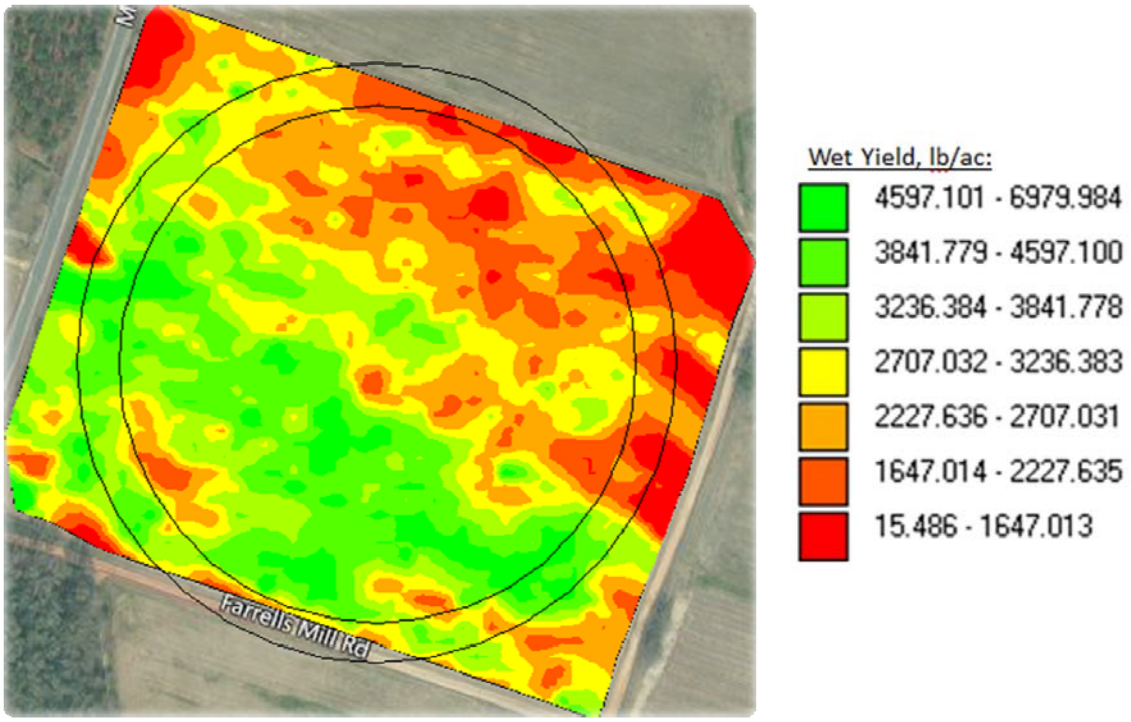
If the specific yield monitor used does not allow for multiple calibration loads, it is still possible to collect multiple loads within a single calibration and sum the weights of the separate loads for entry. It is important prior to the start of a calibration load to ensure that the grain tank and discharge auger are empty. It is also important at the end of a calibration load to allow sufficient time for the harvested grain to make its way through the combine, up the elevator, and into the tank. If dry weight yield maps are desired in addition to wet weight yield maps, then the moisture sensor should also be calibrated.

Opportunities of Precision Ag in Hay Production

Perry Loftis—Precision Ag Graduate Student

Agriculture, like other industries, is ever changing, and with a dependence on our industry for people to live out their day-to-day lives, we must lead the way in implementing new technologies. This is not a new concept; it is simply common sense. Currently, we are seeing a big movement toward precision agriculture, which is basically a fancy way of saying that we're implementing new technologies. What exactly is this new technology? It may be anything from soil texture maps to on-the-go yield mapping systems to put on your harvester. It becomes precision agriculture when we take the next step by using those tools and technologies, combined with good management decisions, to increase yield and/or lower the cost of production. Row crop producers have been doing this for a while, but we should be applying this concept to other forms of agriculture. No two fields are the same, whether you're growing corn or raising a field of Bermuda grass to harvest for hay, and so no two fields should be treated the same. Most row crop producers have realized this and are using precision agriculture to make good management decisions. For example, they will not usually apply a blanket rate of nitrogen to all of their fields. However, many hay growers that apply fertilizer after a cutting pick one rate and apply it to all of their fields, increasing their costs while not necessarily increasing their yields. If we are going to take the time and energy to grow and harvest a crop (corn, wheat, soy beans, peanuts, HAY) whatever it might be, why not take a little extra time to decide the correct fertilizer application or best management practice for our field? For row crop farmers, it has been easier to implement these techniques because they generally keep better records on their fields than hay growers, and technologies for row crops (ie. yield monitors) are more advanced. However, there are numerous technologies on the market to assist hay growers in making management decisions if we chose to implement them.

There are companies providing on the go hay bale weighing technology for round balers and large square balers. These systems use load cells to weigh the baler right before the bale is kicked from the baler and then weigh the baler again right after the bale is discharged to obtain a tare weight. The two weights are subtracted, and the result is the weight of the hay bale. This information is useless unless the grower applies it to their operation. If hay producers are growing hay to sell, then knowing the exact weight of a bale or an average weight of load can be used as a marketing tool. Knowing how much hay was produced in a particular field could be beneficial when looking at how much fertilizer to spread after a cutting. If those bale weights are paired with GPS coordinates, then a rough yield map for the field can be made, furthering the way growers could apply this technology to their individual operations.



This is a contour map showing seven yield zones of a 25 acre, Tifton-85, irrigated hay field at Clemson University's Edisto Research and Education Center. The data for this map was collected using the new yield monitor system during the first cutting this year, which occurred in May. The two circles on the map outline the coverage of the center pivot, with the inner circle showing what is directly under the pivot and the outer circle showing what is covered by the end gun.

Opportunities cont.

Load cells are not the only way to measure the weight of individual hay bales. In the 1980's, hydraulic pressure transducers were developed for use in large earth moving equipment so loader operators could tell how much each bucket weighed. This same technology is available now for small loader tractors or anything that lifts using hydraulic power. It measures the amount of hydraulic pressure required to extend a hydraulic arm (or lift a loader/forks) and correlates this pressure to weight, which is displayed on a small screen inside the cab of the tractor. Researchers at Clemson University's Edisto Research and Education Center are currently applying this technology to the hydraulic bale ramps of round hay balers. Most round hay balers are equipped with either a bale ramp or a push bar that moves the hay bale away from the baler after it is discharged from the baling chamber. For those balers that are equipped with a hydraulic bale ramp, a pressure transducer can be outfitted on them; however, instead of measuring the pressure required to extend a cylinder, it measures the spike in pressure caused by the bale falling onto the bale ramp as it is discharged from the baling chamber. These peaks are then correlated to bale weight. The correlation has a surprisingly low error compared to how inexpensive the pressure transducer is and how easy it is to install. As stated earlier, if those bale weights are paired with GPS coordinates from the exact location where the bales were kicked, then a rough yield map can be made for that field.

Although using the method mentioned above to construct a yield map is better than nothing at all, it is still not the best way to construct a hay yield map. That is because a hay bale contains forage that did not come from just that one spot in the field. A solution to this problem is to be able to calculate the amount of hay going into the baler at a specific time and the exact location of the field as it is picked up. Luckily for hay growers, the same precision ag engineers at Edisto Research and Education Center that are working on the individual bale weighing system, are also working on this new technology. They are placing sensors on the tongue of round hay balers to record the height of the windrow as the baler picks it up. This windrow height is referred to as mass flow, and when paired with a GPS, an on the go yield mapping system is made. This allows hay producers to see exactly where those high and low yielding areas are in their field and make management decisions accordingly. Unfortunately, this yield mapping technology will not be commercially available for a couple of years, but in the meantime I would like to encourage hay growers to explore new ways to implement technology into their operations. Keeping records on weather conditions and fertilizer applications can help you find out what works best for your individual fields, and whether making management decisions from soil analysis or simply counting hay bales to estimate a tonnage per acre for each field; implementing precision agriculture techniques can help your farm be more profitable and productive.

New Technology

Bo Blanchard—Precision Ag Manager, Blanchard Equipment Company

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Hollens Free
Extension Precision Ag Associate
64 Research Rd
Blackville SC, 29817
C: (803)300-2086
O: (803)284-3343
Email:
free@clemson.edu

Upcoming Events

September 1, 2016—Peanut Field Date at Edistio Rec