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Sensors: It all starts with installation

By Mary Love Tagert, PhD

When used correctly, soil moisture sensors can be a valuable tool for helping farmers know when to irrigate. Ensuring the information gathered by sensors is reliable and useful starts with proper installation. with proper installation.

Sensors should be installed in the row with the crop, and it is best to install them when the crop is young, roughly 6 inches in height. This helps to minimize damage to the crop and provides the sensors an opportunity to go through a few wetting and drying cycles while installed in the field. Installing sensors when the crop is young allows more time for the sensors to acclimate to the soil before the farmer is ready to begin irrigation applications.

It is also important to install sensors throughout the crop's root zone. For soybeans, you might have sensors at depths of 12, 24 and 30 inches, and in corn, you might also add a sensor at a depth of 36 inches. It is critical that sensors have good contact with the soil and are "grouted" into the soil when installed.

Maximum benefit

Sensors should be placed in the best location for maximum benefit. What should you consider when determining where in the field to place sensors, and how many sensor stations do you need per field? It can quickly become confusing when reading varying recommendations that range from one set of sensors for every 80-100 acres in a field to one sensor station for every 10-15 acres.

The short answer is that there is no set number for the density of sensors over a given area, although there is ongoing research at Mississippi State University to develop better answers to this question. The following are some general guidelines to consider.

What type of soil?

First, consider the primary soil type(s) over your field. If you have more than one major soil type, you will want to place a set of sensors in each major soil type because soil texture affects the available water holding capacity. For example, soils with a higher clay content can hold more water. Sandier soils have a lower water holding capacity and would likely require a different, lower irrigation trigger point.

If your field slopes, it is a good idea to place one set on the higher elevation and one set on the lower end of the field. When determining sensor placement, be sure to avoid any skips in the row, and install sensors in an area of the field with representative plant emergence and spacing.

What type of irrigation?

The type of irrigation application is also important when determining sensor locations. If you are irrigating using a center pivot, the recommendation is to place one set of sensors just after the start of

the pivot and one set at the end of the rotation just before the pivot stops. When the center pivot turn is completed, the start point will be the driest area, and this sensor station will be in the best location to determine the timing of the next irrigation application. Avoid placing sensors near the end of the pivot, as coverage is not as consistent under the end gun.

For drip irrigation systems, water application will be more precise and efficient, but it is important to remember that water needs will still vary by crop and soil type. Install sensors within the row and in the active rooting zone of the crop with roughly one sensor for every 12 inches of crop rooting depth. There are even low tension granular matrix sensors (40 centibars and below) available for greenhouse applications where rapid changes in soil water status may occur.

In furrow-irrigated fields, one set of sensors should be placed about one-third of the way down the run and another set roughly two-thirds down the run, just ahead of the tailwater. If it is not blocked, the end of the furrow is usually where water infiltration is the poorest.

There will be less soil moisture variability over the field when the soil is wetter. However, sensors installed over a field may still not read the same even after an irrigation application or a rainfall event, unless the rainfall is heavy, in which case they will all drop closer to zero. This is because water may be held in the top soil layers before reaching the deeper sensors, and crops will continue taking up water during and after an irrigation application or rainfall event. As the field starts to dry out, soil moisture variability will increase, even in a field with homogenous soils.

When using soil moisture sensors, it is important to look not only at the number the sensors are reading at a given time but also the patterns shown by soil tension readings over time. If sensors are used with these guidelines in mind and with minimal investment on your part, you will save water and money by better timing irrigation applications to match crop water needs.

Author's note: The information provided is based on research using granular matrix soil moisture sensors.

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Below – left to right: Spatio-temporal soil moisture over an 18-hectare field on May 23, followed by a period of no rainfall until May 28 just before an irrigation application, and after an irrigation application on May 29.