A Home Run Would Be Nice: Wireless May Help

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Currently many of the commodity prices of the crops grown by farmers in the mid-South remain strong. The best of all worlds for the farmer is when good crop prices combine with bumper yields.

One of the surest ways to garner top yields is to be on top of the irrigation game. Irrigation scheduling programs such as the *Arkansas Irrigator* or the *Woodruff charts* do an excellent job for southeast Missouri (SEMO) irrigators by estimating soil moisture conditions. However, even better than estimating moisture conditions is to actually measure those conditions. Table 1 shows the increased amount of yield enjoyed by those irrigators who used scheduling (the *Arkansas Scheduler* or *Woodruff charts*) and those using soil moisture sensing devices over the counterparts irrigators who do not schedule irrigation or use sensors (Bootheel Irrigation Surveys). In terms of dollars this means that over the last nine years non-schedulers have left about $40 to $50 an acre in the field due to poor irrigation timing!

The last column of Table 1 shows the benefit in yield jump when sensors were used. Since not too many SEMO irrigators use sensors the sample size is small, and that should be kept in mind in viewing the results. However, the indication is that using soil moisture sensors jumps yield. Also, this goes in hand with what several local growers who have adopted the technology are seeing – increased yields and less pumping.

One of the biggest drawbacks to using sensors was having to frequently go out to the site, read the data, and then go back to your computer and enter it before you could see the moisture trend graphs. Today that is no longer a problem due to low-cost telemetry (wireless) solutions. Now all data can be sent wirelessly to your computer for as little as an annual cost of $5 to $7 an acre. Many of the systems are actually able to send you a text message on your cell phone when it's time to turn the water back on.

The University of Missouri Delta Center has been studying the economics of wireless sensors for the last several years. Systems costs from various wireless companies for a 135-acre pivot can be seen in Table 2. Note that the system costs are different when the set up has the data go directly to your computer (To-PC) versus when the data is sent to a company's Internet site (To-WWW). The added cost comes from a bit more equipment plus annual cell phone charges. However, the To-WWW is influenced by economy of scale and if a second or third pivot is included then the per acre annual costs approaches the To-PC cost.

One indication that this technology is beneficial is that the Black Gold potato company plans to have wireless systems out in all of their dozens and dozens of pivots watering 17,000 acres throughout the US this year. Other SEMO area farmers have recently tried wireless sensing and have found it too worked for them.

One of the most important components of success in wireless sensor management is that the communication must be flawless. In the middle of a season if data is interrupted to the farm computer the user won't have time trying to reestablish data links. One must keep in mind that for the most part wireless sensor companies are longtime sensor companies now adding a telemetric option. The wireless aspect can fall behind and not be as well thought out. For example, the small radio receive that you hook onto your computer to receive signals comes with a serial port end, not a USB one. Computers don't have extra serial ports these days, so you have to call the company or go to Radio Shack to get one, even before you get started. The MU research focuses communication ability of various systems and how "user friendly" systems are.

The Systems Work

I know for a fact that this technology helps increase yield. In 2008 over five seed populations, two row widths, and three varieties, our soybean trial yielded 60 to 70 bushels per acre (we irrigate using the Arkansas Scheduler). This year the yield was less the 40. The staff member who handled the irrigation this year was new and wasn't use to the Arkansas Scheduler and apparently let things get hot. Afterwards, trying to track down the cause of the yield drop I examined sensor data from that field. Figure 4 shows the plotted data and one can see that several times during the season the field got IRRIGATION warnings that weren't responded to. The appearance of the crop wasn't bad and assuming the Arkansas Scheduler was doing the good job it usually does, yield was slipping away unbeknownst to me. One timely look at the wireless sensor output would have changed that.

Regular Bootheel Irrigation to be Replaced by Local Wireless Sensor Meetings

There will not be a regular Bootheel Irrigation Conference that is normally at the Rone Hall of the Delta Center in December. Instead, several mini-meetings and workshops on wireless irrigation sensing will be held throughout the state. Tentative locations are Kennett, Sikeston, Columbia and Lamar. The meetings will occur around the week of Jan 16 of 2011. Further information will be forth coming. The purpose of the meetings is to have farmers and company reps get together to discuss installing some of these systems in the field for this year's next crop. Hopefully, with these sensors and good commodity prices we can have a lot of SEMO farmers hitting homeruns in 2011.

A list of wireless sensor companies follows. For more information about the wireless mini-meetings call the Delta Center (573.379.5876) or Joe Henggeler direct (573.225.7986).

Table 1. The yield increase from using various irrigation scheduling methods over that of irrigators who do not schedule, 2000-2008.

Crop	Arkansas Scheduler	Woodruff Charts	Soil Moisture Sensors
Corn	11.3 bu/ac	13.7 bu/ac	41.0 bu/ac
Cotton	29.0 lbs/ac	248.2 lbs/ac	271.5 lbs/ac
Soybeans	6.0 bu/ac	10.6 bu/ac	No data

Table 2. Annual per acre costs of various companies for complete TSMS system (3 locations and 3 depths) on a 135-acre pivot for both To-PC and To-WWW configurations.

Company	To-PC	To-WWW
Onset Computer Corp.	$6.12	$15.36
Irrometer Company, Inc.	$5.75	$12.93
Spectrum Technologies, Inc.	$6.97	---
Campbell Scientific, Inc.	$6.58	$10.64
Decagon Devices, Inc.	$6.62	$11.15
Smartfield	$6.58	$10.64
Adcon Telemetry, Inc.	---	$13.67

Fig. 1. A mounting pole secured in place inside a buried PVC pipe for easy breakdown to allow equipment to pass. Sensors are buried and hooked to transmitters mounted on the pole which forward data on to a desktop computer.

Fig. 2. Another type of sensor transmitter peaking over the canopy of rice grown under a pivot. This device handles three moisture sensors and one temperature sensor. Problems in communication can occur if the transmitter is not higher than the canopy, which was happening here.

Fig. 3. Another type of sensor actually measures the canopy temperature. When the canopy gets a certain set temperature (different for various crops) for a number of hours and IRRIGATE ! signal is sent.

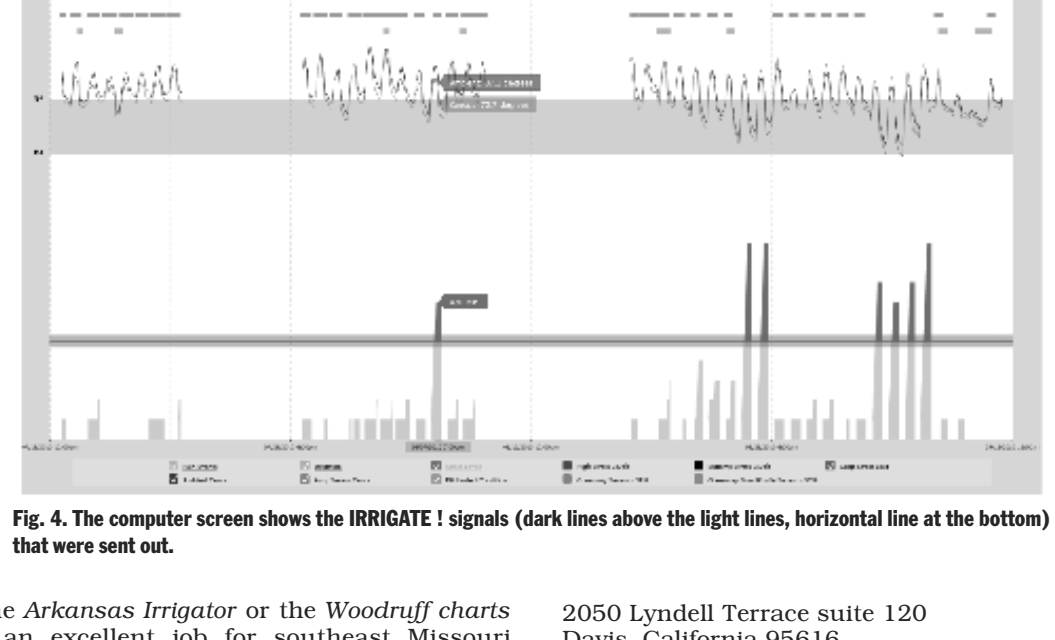

Fig. 4. The computer screen shows the IRRIGATE ! signals (dark lines above the light lines, horizontal line at the bottom) that were sent out.

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