Responses to the Questions Received During the Webinar *Water-efficient irrigation technologies: Florida, North Carolina, and Oklahoma extension programs (2-8-2011)*

Responses provided by:

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**General Questions:**

*In the Pinellas Study (FL), why do you think the SMS were better than rain sensors? Was the installation done particularly well - better than would be done by the average contractor?*

*Response by Mike Dukes:*
The SMS controllers resulted in more irrigation savings since they are more responsive to rainfall than rain sensors (RS) and they can respond to excess irrigation unlike RS.

*Response by Garry Grabow:*
I am not sure about the Florida study, but in our Cary study in North Carolina, we left the rain sensors active, so in a sense there were "2 gatekeepers" - the soil moisture sensor (SMS) and the rain sensor. The SMS is a more "direct" measurement of the soil moisture condition and of the need to irrigate than a rain sensor.

*I am very interested in soil moisture sensors as well as a comparison of them against ET controllers.*

*Response by Garry Grabow:*
This could be a long answer, but from my experience, in general, the sensors will reduce water usage more than ET controllers. There are some caveats to this and contractors prefer to install ET controllers since there is less wiring, digging etc. If the interface controller is not programmed to apply enough water, the sensor cannot “make up” water, so that is a potential down-side.
Response by Mike Dukes:
See our research publications on my website for some specific comparisons. Irrigation savings have been of similar magnitude in a limited amount of plot studies for the two technologies. In cooperating home studies, SMS savings have been similar to plot studies. On the other hand, in cooperating homeowner studies with ET controllers, irrigation use was increased where ET controllers were installed on homes with relatively low background water use.

Isn't there something about the resident being able to see the rain sensor work when it rains?

Response by Mike Dukes:
Perhaps, but there will be a time lag until the sensor engages and rainfall may not occur to a depth sufficient to trigger the sensor, yet the homeowner might think it has rained “enough”.

Response by Garry Grabow:
I suppose, but it’s an instantaneous off thing, and you would have to know that your system should be running to “enjoy” the effect. I know with mine it’s a sort of I know it’s not working or I need to adjust the setpoint if it’s raining appreciably and my irrigation system is on.

Did any of the projects provide a summary of gallons "saved" over dollars spent? What are the installation cost differences for different technologies?

Response by Garry Grabow:
Short Answer “No”. Personally I don’t like the water saved term unless it is clearly applied against a quantifiable standard. Of course that’s not an excuse for not developing such a statistic. In my mind the “saved” portion is best derived by a change in behavior by a subject or group. That is complicated by changing water demand over time, so for instance I may pay for a smart controller and apply more water in year 2 than in year 1 because there was a higher irrigation water demand. In this case I have not saved anything – BUT - I may have irrigated more efficiently. Of course over time the average will take over and the assumption is that water will be saved as compared against prior behavior on a gallons basis. There is a conservation limit, because plants need water to keep cool and to be physiologically happy (I somehow get paid to state the obvious). I like to think in terms of “efficient irrigation” or comparing an irrigation requirement against applied water myself.

Response by Tatiana Borisova:
A discussion of water savings associated with installations of efficient irrigation technologies is presented by Dr. Mike Duke in his narrated presentation at http://www.slideshare.net/unlautahgreen/michael-dukes-irrigation
Another good example can be found in US EPA publication *Sub-surface Drip Irrigation Cost Calculator* at [www.epa.gov/osw/conserve/rrr/greenscapes/tools/drip.pdf](http://www.epa.gov/osw/conserve/rrr/greenscapes/tools/drip.pdf)

Further, Vickers (2001, p. 200) provides the following estimates of the costs and water savings associated with different technologies:

**Shut-off devices activated by rainfall:**
Installing a device that can shut off an automatic irrigation system in response to rain can save an estimated 5-10% of water used outdoors. Rain sensors cost $15 - $45.

**Irrigation system controllers (for automatic in-ground sprinkler and drip systems):**
The amount of water that can be saved through improved programming of an irrigation system controller varies but is estimated to be at least 10 to 15%. The cost of automatic irrigation controllers for residential use ranges from about $50 to $250, depending on the features provided. Commercial-use controllers can cost up to several thousand dollars.

**Soil moisture probes and sensors**
Using a soil moisture probe or sensor can save an estimated 5 to 10% of water used outdoors, provided. (…) Moisture sensors and tensiometers cost $35 to $125. Gypsum blocks, which must be replaced at least every two years, cost $5 to $10, but the meter to read them costs $150 - $250.


*I have noticed that most people when they talk about water conservation in general think about the municipal water use, how does someone who has mainly well provided water receive the cost benefits?*

*Response by Tatiana Borisova:*

This is a very good point. Well owners can benefit from water conservation too. Here are a few facts taken from a publication by Water Systems Council:

“Water conservation can help well owners secure their drinking water supply, save money and protect the environment.

… If you have a low yielding well (less than 5-10 gallons a minute), you should be very careful of how much demand you place on the well. If you live in a drought region or an area of rapid development where groundwater supplies are stressed, you need to reduce consumption to ensure an adequate supply.
... Water conservation saves money by reducing wear and tear on your well and septic system. The hundreds of gallons of water released from your home each day eventually saturates the soil in and around the septic field to the point where extensive repair or replacement is necessary. The cost to replace a septic system can reach $4,000 or more. Conserving water will extend the life of the system and delay the need for repair.

Water conservation also helps protect the environment and the quality of your drinking water”.


Questions to Garry Grabow:

**What are some ways to know how to pre-program an irrigation system when planning an extended vacation? Say 2 to 4 weeks**
an ET based controller or soil-moisture sensor system (smart systems) would take care of weather variation. For standard controllers - make sure you have a rain sensor!

**Can you comment on the use of harvested rainwater for irrigation purposes and how to solve challenges such as moving water uphill**
Probably wouldn't get the "bang for the buck" using these on low-volume systems like drip, but they could be interfaced with a cistern system.

**Do you know of any existing research that ties smart irrigation technologies to the reduction of stormwater runoff and the resulting reduction of pollutant loading to surface waters?**
Most of my stormwater colleagues are looking at using smart technologies with cistern systems as a "land application" system to opt out of stormwater fees. The complication is that the goal may be different from an agronomic (plant health) perspective

**Did the gross estimated need account for any additional irrigation need that was necessary to overcome system inefficiency?**
The gross irrigation requirement was based on "regional" rainfall and did account for an efficiency of 80%

**I would like to know more about how the requirement for irrigation contractors to be licensed works in terms of enforcement of it. As you know, the Florida Irrigation Society is trying to get such a program implemented.**
If you mean the enforcement of making sure it’s a licensed contractor doing the work, I think much of that is controlled at the local level when a “permit is pulled” for a system for those that require drawings of a system like the town of Cary. However the board does take responsibility for enforcement and it appears to be primarily a complaint-driven system. This page has a complaint form for download: http://www.nciclb.org/enforcement.cfm

*In Florida the 1991 law or its amendments haven’t been enforced, in my opinion, because they are part of Florida Water Law and not in Building Code, so they are basically not enforced.*

**Has it been handled more effectively in NC?**

As stated above, it “officially” is handled by the licensing board under the power given to them by state statute. I do not know how effective the complaint – driven system has been. It’s only been in effect for about 1.5 years now.

**Did North Carolina other than Cary pass a rain sensor requirement?**

From city of Durham website.....

“The ordinance also requires that new irrigation systems be equipped with properly operating rain or soil moisture sensors in appropriate locations to prevent irrigation during rain events or when there is sufficient moisture in the ground for plant health and survival. Existing automated irrigation systems must be retrofitted with moisture or rain sensors by November 30, 2009.”

I would take this essentially to mean rain sensors in practice – not a lot of soil moisture sensors installed here in NC. The city of Raleigh says it now has the same watering restrictions as Cary but I cannot find a stipulation on rain sensors. Cinnamon Black and Ed Bucham of Raleigh could answer those questions, just google there names with city of Raleigh. I believe Morrisville (neighbor of Cary) and Chapel Hill have rain sensor ordinances too. The city of Charlotte bases restriction on certain water supply conditions that precipitation different stages of restrictions. At times there are no restrictions and I don’t think they have a rain sensor ordinance (at least I couldn’t find one).

**Questions to Michael Dukes:**

**How much are the smart controllers ($500) vs. the average FL rebate?**

I’m not sure there is an "avg" FL rebate, but controllers can be had for $200-$300 (not installed).
General: Have any tests or research been done within DOT right of ways?
Department of Transportation “right of ways” are typically not irrigated. We have done and are doing research on turf grass water requirements.

When setting SMS systems how low can you generally set the % moisture on a sensor system? Does this soil moisture % number vary greatly among different soil types?

SMS threshold setting is based on saturating the sensor and then allowing to drain (i.e. field capacity). Yes it will vary widely based on soil type.

What changes would you like to see to the law impacted by 2009 SB494 (373.62, F.S.)???

It would be logical to change the specifics of the legislation such that proven technologies might be acceptable rather than the very detailed prescriptive approach specified in the current legislation. For example, the legislation might reference a testing specification such as the upcoming WaterSense weather based controller specification.

How can you get homeowners involved in purchasing these units and are there any grants available to assist them?

Education of the homeowners and irrigation professionals on the advantages and disadvantages of this technology is critical to get end users involved. Availability of grants depends on local municipalities. There are a number of examples in Florida.

Is there any way to connect these with rain barrels to drip irrigation and other systems?

Rain barrels serve as a water source for the irrigation system; therefore, any control system can be adapted. Smart controllers can be used with microirrigation.

How can you quantify un-metered water usage?
Usage can not be quantified without a meter. Use could be estimated if irrigation zone flow-rates are known and runtimes are known but many errors can occur such that this estimate is not accurate.