

Improving Irrigation Efficiency in Pears Virtual Field Day: Irrigation Sensors with Jac LeRoux

Transcript of one virtual field day presentation hosted by Tianna DuPont, WSU Extension, Troy Peters, WSU Biological Systems Engineering, Lee Kalcsits, WSU Horticulture.

The first thing, and most important really, is when and how much to irrigate. As simple as that sounds that is the holy grail of irrigation water management. If you know when and how much, you have it.

There are sensors that can help us identify that profile and I have some samples that I'd like to show. I happen to have a see-through version of a probe like this. You've heard all about the probes from Troy. From a commercial point of view, we like this kind of thing. It's a capacitance probe, but we call it a profile probe because we have numerous sensors built into this. This is just a 2 foot one with 6 sensors built into there and you can actually see them there in pairs, but you can actually get this in any length. The wine grape people might put in 6 footers of these and you can get up to 15 sensors in them. But the beauty is I'm going to make one hole and I can auger it tight and I'm disturbing a minimum of soil. I press this in very deep and it's designed to be subsurface. So, this is a see-through version but the real thing just grey and it's fully filled up with resin, and I've got one of those so that's what it would look like, the real thing. And you can bury this thing below the surface. The beauty is once you've done that it is safe, people can walk over it, put a ladder on it, drive a vehicle over it. The only thing that will kill it in an organic orchard is a rototiller if it slices it.

And then we have wire on it, we'll run it through a conduit to keep it safe from gophers and things, take it up a post, and into the telemetry box. And here we have a sample of that. And this telemetry unit can do all sorts of things. It's a data logger that will activate the probe, take a reading as often as you like, package it, send it off. In this case cellular. And you can see it has solar panels that'll recharge its own battery. And underneath there are inputs for several other things like a pressure switch in the line. Very handy to know when the water is on. You could put an ambient air temperature sensor on here, you could use it for frost control, you could know when you need to do hydro cooling if you have the ability, and so on, leaf wetness sensors; you could build this into a complete weather station right here in the orchard. And this is one model and they come in all shapes and sizes.

This here is another one which is very compact. Doesn't even have solar as you can see. It has a high capacity battery that lasts several years, and it has all the basic connections. So, I can put a probe, a switch, a temperature sensor, and so on in there and very conveniently packaged. Again, it can be cellular, or it could be a radio, or it could be satellite. And that's just our way getting the data out.

So, between what's happening below the ground to what's happening on the computer screen. That's kind of the magic link between the two. So once the information gets on the web, we'll feed it into a computer program where we can do all sorts of numbers. But the one important thing is we have a continuous data being collected, that's the blue you see here. Important for us is the definition of field capacity. Now normally when you irrigate, as you can see here, you'll see the water spike up. It'll actually saturate the topsoil for a short while and when the water's shut off you'll see it drain out of that section and you'll go back to a normal consumption. Troy had that beautiful demonstration of the sponge. We want to find that magic spot here to know what the soil can hold against gravity. That's our field capacity line. Then we have another management refill point here and then we want to stay

between these lines to keep us in the comfort zone. If you just look at the root zone average that you're dealing with that might be the average of multiple sensors and I'm going to show what it looks like more detail. So, if you take the same probe, now we're reporting data through telemetry like this coming in every hour and for multiple sensors. And now you can see, let's take this one, we fill them up and you can see the topsoil that's the red and the orange dropping down very rapidly. Then as you get deeper and deeper you can see less root activity and the consumption is coming down slower. So, on average would be fine but the topsoil is drying out fairly rapidly. But there again this is what we want to know in terms of our timing when to irrigate and here we want to know how much water to apply. And if we can get that right that is optimal, and we can do various things depending on the crop and what it is we're trying to achieve.

So, a practical example the very orchard that we're standing in which might not be obvious from this camera shot but it is fairly steep it must at least 12 percent grade. The grower used to have impact sprinkler in here that put out a lot of water very fast and there would be runoff. And a grower might think "you know when the water starts running off this bad it must be full" and meanwhile the penetration rate is too slow and we're getting a runoff before it actually goes in deep enough. And if you have a probe like this in there you would see that you only watered down to maybe 8 inches whereas the subsoil is still dry. So, you could actually have a combination of water running out of your block and stress due to the subsoil being dry. So, the solution is obvious. You want to change your irrigation design and put in a sprinkler system like an R10 that would put down the water slow enough so that it won't runoff, but it will go straight in.