## Subsurface Drip Irrigation

## Part 1

## Season 1, Episode 9

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**John McMaine:** Thanks for joining us on Streamlines, your source for water knowledge. I’m your host, John McMaine with South Dakota State University Extension. This is Episode 9.

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**John McMaine:** Hello again everyone, this is John McMaine.

**Anthony Bly:** AndAnthony Bly.

**John McMaine:** And today Anthony, we are talking about subsurface drip irrigation.

**Anthony Bly:** Oh my goodness.

**John McMaine:** Yeah! What’s-

**Anthony Bly:** Fascinating stuff.

**John McMaine:** Fascinating stuff. So, what do you think of when you think of subsurface drip irrigation?

**Anthony Bly:** These little tubes that go through the soil and, and supply the roots with water.

**John McMaine:** That’s exactly right! So, I have, actually have some experience, some hands-on experience with drip irrigation. So just a little anecdote here. When I was growing up in Kentucky, my old Kentucky home, we raised vegetables and we sold them at the farmer’s market. We had about two acres of vegetables. And one of the tasks every spring before planting and every fall, was to manage our drip irrigation system. And so, we would run T-Tape along the rows, which was, yeah, these little blacktubes that had little slits in it. And then, we’d set up the pump and we had a fertigation system. And it was, it was surface drip irrigation, but yeah, I had hands on experience before I ever went to college to be an engineer with surface drip irrigation. So, it is near and dear to my heart. Even though I didn’t appreciate it at the time, it, it was good experience. Anyways so subsurface drip irrigation, it kind of is a technology that is used in predominately higher value crops. But we’re seeing use and uptake in row crops.

**Anthony Bly:** Yes, we are.

**John McMaine:** And it’s a really interesting trend, there’s value in it. It, it has value and so, I talked to my good friend and colleague, Dr. Todd Trooien. So, we’re going to be hearing from him today about subsurface drip irrigation and he’s worked on subsurface drip irrigation, probably for 20 years plus. He was in Kansas for a while where a lot of this technology was pioneered. We’ll let him tell us what exactly is subsurface drip irrigation.

**Todd Trooien:** Subsurface drip irrigation is, is the, the practice of placing drip lines with individual emitters below ground then generally depths of maybe ten to twelve to eighteen to twenty inches deep. And then we tie multiple drip lines then together into our water source.

**John McMaine:** So, it’s not necessarily a complicated process. You’re taking water, you’re putting it exactly where you want it.

**Anthony Bly:** Right.

**John McMaine:** So, there’s some efficiencies there which is a nice thing. But I asked Todd, kind of how this differed specially on the efficiency question from other types of irrigation, specifically pivot.

**Todd Trooien:** When we apply the irrigation water with the SDI system directly into the root zone that means we’re bypassing the soil surface. And by not adding salts at the soil surface, then we’re avoiding problems such as, perhaps, if there’s some sodium in the water that might increase soil dispersion or, or cause some infiltration rate problems. We’re, we’re avoiding some of that by introducing the water directly into the root zone, instead of at the soil surface. When using SDI, we need to be careful of where the wetting front end up in relation to the drip line. And as water gets pushed outward and upward and downward from the dripline and then water moves through the soil. And, and water carries the salts then in the soil. Where the roots extract the water from the, the root zone, from the soil. Then, it leaves the salts behind so sometimes salts can accumulate at a location where the, where the wetting front has set up consistently. So, we need to be careful about salt accumulation in specific locations if our design andmanagement would force, if you will, a wetting front stability kind of thing where a lot of water gets extracted in the same area and leaves behind a lot of salt. Again, we get some flushing from our wet cycle when, when the drainage system would be active, but we do need to be careful of that potential salinity accumulations in specific places in the roots.

**John McMaine:** Thoughts?

**Anthony Bly:** Yeah, I mean, I, I suppose it’s a water source.

**John McMaine:** Yeah.

**Anthony Bly:** You know.

**John McMaine:** It goes back a lot of times to what’s the water source and the water quality and considerations of what you’re actually putting into the soil with that water.

**Anthony Bly:** Right.

**John McMaine:** And how’s that’s going to affect that soil. There are some benefits. So, if you compare SDI and surface irrigation, like a center pivot, one difference would be kind of where the salts would be in the soil, right. And so, you don’t have them on the surface but you’re not out of the woods. Because like Todd mentioned, you have that wetting front and you could run into problems with that if you don’t monitor that. Because then you’re, basically your flow is constrained around that wetting front because that’s where the salts get to. And then you’re constraining any, any growth within that wetting front.

**Anthony Bly:** Both promoting and maybe inhibiting at the same time, is what I’m taking in from that.

**John McMaine:** That’s a good point, yeah. So, we have an episode on subirrigation, which is irrigating through tile. And I asked Todd to differentiate for us subirrigation, which is also a subsurface, you know, delivery of water and subsurface drip irrigation, and this is what he had to say.

**Todd Trooien:** Subsurface drip irrigation, or, or SDI, is the specific addition of drip lines underground in the field. As opposed to subirrigation, where we just reverse the direction of water flow in, in our drain tiles. Subirrigation would use an existing or anewly installed drainage system, and to introduce water into the ground. So, subirrigation would be kind of a dual-purpose system. Whereas SDI, subsurface drip, is a specific irrigation system than an optimized than to, to apply water as an irrigation system.

**Anthony Bly:** Got it.

**John McMaine:** Yeah, I don’t think we need to talk about that one today.

**Anthony Bly:** No, that’s very clear explanation.

**John McMaine:** Yeah, and so, one downside, I guess, of subsurface drip irrigation versus subirrigation is that it’s a separate system but there are benefits because it is easier to manage. Like you don’t have to, with subirrigation through tile, you have to actually raise the water level up from the tile to wherever the roots are.

**Anthony Bly:** I would think that would take a lot more water.

**John McMaine:** It does. And so, subsurface drip irrigation, a, you’re using emitters to, to a small amount of water and you’re targeting right at the roots zone so it’s more efficient.

**Anthony Bly:** A lot more efficient.

**John McMaine:** Yeah.

**Anthony Bly:** Maximum efficiency.

**John McMaine:** Maximum efficiency. And so, I asked Todd about this, and Todd said subsurface drip irrigation is the most efficient irrigation system, as you might imagine.

**Anthony Bly:** Absolutely. I can see that.

**John McMaine:** And the two biggest reasons are the amount of water that you’re using, you’re not wasting any water doing other stuff with it, right?

**Anthony Bly:** Yeah.

**John McMaine:** Surface irrigation, it, some is going to evaporation.

**Anthony Bly:** Run-off.

**John McMaine:** Run-off and then SDI also delivers the location of where the water goes is maximum efficiency as well. So, it’s a good system, it has a lot of positives. But as with everything Anthony, it is not perfect.

**Anthony Bly:** No.

**John McMaine:** So, I asked Todd what are the downsides or challenges with subsurface drip irrigation and a lot of it, honestly, centers around the same things that make it good, right? So, you have these really small holes, you’re not putting down much water. But, if you have anything in the system, you can run in to problems. This is what Todd had to say about challenges with subsurface drip irrigation.

**Todd Trooien:** So, SDI as a, a micro-irrigation system that is an irrigation system with small flow rates per emitter means that the, the holes through which the water flows are, are very small. And, and because of that then, they are easy to clog with like silk particles or sometimes a chemical accumulation in the emitters or, or root intrusions in the emitters in some cases can be a problem. And those things can lead to then the leading cause of problems in micro-irrigation systems and that’s emitter clogging. And worldwide, the biggest cause of micro-irrigation system loses. But if we take some specific steps, we can help prevent or avoid emitter clogging. And so, to do that we use the, the five-step program for emitter clogging prevention. First, chose the right hardware and especially the right emitter. Emitter selection is a compromise between low flow rates which bring economic advantages to the system versus higher flow rate emitters which are easier to keep unclogged, as the holes are bigger so they’re easier to keep clean. Step two then is filtration. We have to have some sort of filtration system to remove any solids in the water. Step three is some sort of flushing has to be available. Even though we are filtering the water and removing the solids, there are always particles that are smaller than the filter size that we use. Fourth then, we need to have some way to injecting some chemicals into the system. And in terms of keeping emitters clean, very often that involves injecting some chlorine to control the biological growth within the drip lines. Keep things from growing, especially bacteria from growing in the drip lines and possibly clogging the emitters. And then finally step five is we need to have a good monitoring program. We can’t see that the water is flowing out the emitters anymore because the emitters are buried. So, we need to use indirect measures like flow rates, a good flow meter is invaluable here as, as in many cases in irrigation. And a pressure measurement at various points in the system to make sure we don’t have leaks or clogs. So, we use that five-step method for emitter clogging prevention than to, to protect our investment in this SDI system.

**Anthony Bly:** Management.

**John McMaine:** Management is important. And selection, what goes into the system is important and then managing it is important as well. So, this is much different than say, a saturated buffer which, which is a completely different objective. But a saturated buffer, you build it, you can pretty much forget about it. Maybe check on it annually. A subsurface drip irrigation, there’s a lot of moving parts or a lot of potential failure locations and because of that, you got to keep a close eye on your system.

**Anthony Bly:** Absolutely.

**John McMaine:** So that’s all the time we have for today, for subsurface drip irrigation. It’s been an action-packed episode so far and part 2 is going to be even more information. So, in the meantime, consider the downsides of subsurface drip irrigation. And in the next episode, we’ll talk to Todd about how we can address these downsides or challenges in other properties that subsurface drip irrigation can really shine and really help.

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**John McMaine:** Thanks for joining us today on Streamlines. We sure had a lot of fun today, hope you did too! If you want to learn more about anything you heard today, head on over to the SDSU Extension website. But for now, I’m John McMaine.

**Anthony Bly:** I’m Anthony Bly.

**John McMaine:** And we’ll catch you next time.