## Balancing Controlled Drainage

## Season 1, Episode 7

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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 7.

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**John McMaine:** So, when we think about controlled drainage, there are some differences that we consider. I mean, especially with tiling with the contour.

**Anthony Bly:** Right.

**John McMaine:** If you tile up the hill, well then you-

**Anthony Bly:** You’re in trouble.

**John McMaine:** You’re in trouble, yeah. I mean, that, that significantly increases your cost. If you tile on the contour, then you can use one controlled structure on a main to, you know, control 10 acres or something.

**Anthony Bly:** Sure.

**John McMaine:** One contractor I talked to, he said controlled drainage typically raises the cost of a tiling project by about 7%.

**Anthony Bly:** 7%?

**John McMaine:** 7%.

**Anthony Bly:** That’s not a lot.

**John McMaine:** That’s not a lot. And I mean we don’t see yield bumps every year. But some of the research that has been done by the transforming drainage project, just yield comparisons, they’ve seen up to 15% yield bumps. Obviously, that’s going to vary year-to-year. And if you don’t manage it right, you could take a yield hit. But 7% increase in cost, you know, 15% yield bump every third year, every other year.

**Anthony Bly:** You could eventually recoup that then.

**John McMaine:** You could eventually recoup that.

**Jeff Strock:** So, I’m Jeff Strock. I am a soil scientist with the University of Minnesota. And I am located at the Southwest research and outreach center near Lamberton, Minnesota.

**John McMaine:** So, would you say controlled drainage is currently an economical practice?

**Jeff Strock:** So, the question about economic viability and sustainability, you know, from the perspective of water quality and putting some value on the water that’s leaving, I would say yes, it’s very valuable from an economic standpoint. From a yield standpoint, the investment that a farmer is going to have to make to have a narrow drain spacing or a narrower drain spacing and thinking about just the economic return from the yield perspective, I’d say you know, it’s kind of marginal to be beneficial. Because of that extra cost. But if you think about the other benefit over time, I really do think that there is some value there. It’s just, it’s hard to put a number on that. People have tried to put numbers on those things, and it’s never been agreeable that people have found the right number. So, at this point in time I would say that it is a little on the marginal side. Mainly because we have not seen those yield benefits that we’ve really tried to promote and expect that we would see. So yeah, from an economic standpoint, a little tricky. And that, that kind of goes for the idea, you know, that once we have these narrower drain spacings in, we got these practices with, you know, subirrigation or drainage water recycling where we are trying to work with storing some of that drainage water. Not only in the profile, but also you know, in farm ponds and in reservoirs. Sometimes the cost and the effort that has to go in, I think, you know, there are some great lands where people can adopt this. But, you know, broadly speaking, it’s probably not going to be the only tool in our toolbox for farmers to be able to think about how to improve yields and water quality in the future. I think it is certainly going to work for some people, in probably in Eastern South Dakota it has a better chance of being viable. Mainly because of the fact that you guys have a pretty open slate in terms of installing drain tile and installing it, so you can actually use these systems. Where here, you know, in Minnesota, we have been drained for so long, that we require a lot of retrofits and that tends to be more expensive.

**John McMaine:** So, one of the things that Jeff talked about was how controlled drainage really helps us to weather the extremes. Because again, you know, we do have wet periods. We’ve seen wetting increase, wetting in South Dakota.

**Anthony Bly:** Absolutely.

**John McMaine:** We’ve seen in Minnesota. We’ve seen in Iowa. One study by Chris Hay and Dennis Todey looked at the difference between 1960 to 1990, compared that with 1990 to 2009. And that second 20-year period was anywhere from 2 to 5 more inches of annual precipitation. So that’s an 8-20% difference.

**Anthony Bly:** Look at, look at the extremes from 2019 to 2020.

**John McMaine:** Yeah, that’s a huge extreme.

**Anthony Bly:** I had all 47 to 48 inches at my, at my gauge.

**John McMaine:** Yeah.

**Anthony Bly:** My CoCoRaHS gauge.

**John McMaine:** Yeah.

**Anthony Bly:** And this year, I’m about 14.

**John McMaine:** Wow. Wow.

**Anthony Bly:** That’s an extreme.

**Jeff Strock:** So, I’m working with a group of people in Minnesota, the GEMS group which is using the Minnesota supercomputing center and a lot of high-tech expertise, trying to develop sensor arrays and sensor systems that are very economical, much less expensive than what you can buy. You know, typically research wise, like you and I might buy. But again, I think as I’ve perceived it and think about what’s going to have to go into the technology. I think there’s going to be probably a rather expensive roll-out. And then over time, as that technology can become cheaper, than it’ll be more viable. But that technology is going to cost money to get all that set up. I wish I could say without any question or doubt, that, you know, this is the greatest thing since sliced bread, everyone should do it. And that they’re going to make millions of dollars doing it and it’s going to be fruitful. But unfortunately, it has a place, and it has some potential, but from an economic standpoint, it just doesn’t seem like in the very very near future, it’s going to be a great big boom for people. Now, here’s the other thing to think about; as people that work in agriculture, you know, we’re very tuned into sort of the thought processes that are out there. In terms of potential climate variability and climate change. You know, in our part of the world, this northern corn belt area, the projections are that, you know, we’re going to become dryer during the growing season in the future. And, and, and that future that we’re talking about is not that far away, you know. The future climate projections, they’re talking in the next 5 to 10 years. That we’re going to see some of these more drastic shifts. These, these larger extremes. And we’re already seeing those extremes with months where we have some of the wettest months on record, right next to the driest months on record. You know, you’ve experienced it in South Dakota, we’ve experienced it in Minnesota. So, as, you know, as I think about future climate variability and extremes becoming more extreme where we get more frequent and longer dry periods, especially during the growing season which is what climate change people are talking about. Then I think that these types of technologies, conservation drainage, controlled drainage, and automation are going to be a much bigger deal. It really behooves us in those early adopters out there, to be thinking, you know, beyond the end of the nose on our face. And saying okay, you know, I need to be prepared for what’s going to happen in the next 5 years, not just what is going to happen next year. And there’s a lot of farmers out there, that I think that are starting to turn around and think that way. And they’re looking a little more futuristically than just, you know, what’s going to happen. Of course, it’s really important what happens today and tomorrow and next year. But, you know, there’s there’s quite a number of growers out there in the Southern part of Minnesota and I know up in the valley that I’ve been visiting with that are, that are thinking a little bit further out and trying to manage and prepare themselves for the future.

**Anthony Bly:** I guess you can bring this soil health thing in a little bit because aerated soils are more healthy than waterlogged soils.

**John McMaine:** Yeah.

**Anthony Bly:** And totally dry soils are less heathy than moist soils.

**John McMaine:** Sure.

**Anthony Bly:** So, if you can control that middle ground, you’ve got a lot more potential for optimal microbial activity, carbon sequestration, because productivity is higher.

**John McMaine:** Yeah.

**Anthony Bly:** A good nutrient cycle.

**John McMaine:** Yeah.

**Anthony Bly:** It’s kind of the sweet spot. We’re trying to be in the sweet spot of where that corn plant or soybean plant wants to be.

**John McMaine:** Yeah, so really, I mean from Jeff’s perspective, controlled drainage gives us more opportunity or ability to kind of hit that middle ground where we need to be.

**Anthony Bly:** The, the sweet spot where the optimal corn yields come from.

**John McMaine:** Yeah.

**Anthony Bly:** Yeah.

**John McMaine:** I mean, you know a lot about that. You, you work with soil health, you work with, I mean you’re an agronomist, so.

**Anthony Bly:** Yeah, absolutely. You know, water-logged soils are, aren’t healthy. Because we don’t have that aerobic bacteria activity. But in the same regard, the, the soils are too dry are, aren’t healthy as well. So, there’s somewhere in between that we need to be as far as moisture content.

**John McMaine:** Sure. So potentially, controlled drainage maybe active controlled drainage, maybe automated controlled drainage, gives us a better opportunity to hit that sweet spot.

**Anthony Bly:** Right where we want to be.

**John McMaine:** Jeff really has a pretty cool vision for controlled drainage and kind of the potential impacts it has. So, let’s hear what he has to say.

**Jeff Strock:** You know, the things that really do excite me about it, John, are absolutely the technological things that we’ve talked about. Because things are moving really fast, and it ends up being a great opportunity for agriculture and we are actually looking at taking really important discoveries and findings from other disciplines and applying them to agriculture. And bringing it up to be a much more high-tech industry, and it’s been high-tech for years with, you know, yield monitors and those things. But I think, you know, when we start looking at precision management in fields and you think about precision ag in terms of fertilizer. And now you can think about if we’re using this technology and we’re doing conservation drainage, controlled drainage in the field, maybe we’re going to be able to actually manage different areas of the field differently because of the technology and the different soil types. A little bit heavier soil over here, a little lighter over there, within a farmer’s field and that’s just really cool. To be able to embrace that technology, build teams of people that can work on these, and work together to solve problems and come up with really good solutions for farmers. That’s really gratifying as a person who works in ag.

**John McMaine:** Wow! He got pretty excited about controlled drainage.

**Anthony Bly:** He, he got really excited. Really riled up.

**John McMaine:** And honestly, like his vision makes me really excited too. One factor I liked that he brought out was any advances made in controlled drainage, like that could potentially have impacts in any drainage technology that we would consider in the future, so.

**Anthony Bly:** Sure.

**John McMaine:** If we can actively manage controlled drainage, we can actively manage bioreactors, we can actively manage saturated buffers. And all it takes is, inputs, algorithms in the sensors and technology to do that.

**Anthony Bly:** Yeah, and then we can apply that on a precision scale because not all parts of that field will be the same.

**John McMaine:** Yeah, I love that point. And really thinking again, kind of relating all of this back to precision management, precision agriculture, waters not something we typically think of from a precision perspective. I guess, from an irrigation perspective, yes. But not drainage, not kind of the water in the field.

**Anthony Bly:** Right, we’ve gone from looking at something we’re trying to get out of our way, to using it to our advantage.

**John McMaine:** Yeah. To, to viewing it as a resource that it is.

**Anthony Bly:** Yeah, an important one.

**John McMaine:** An important one. So, we’ve learned a lot about controlled drainage today, Anthony.

**Anthony Bly:** Yeah, absolutely.

**John McMaine:** I mean, the exciting thing to me is you have potential for both water quality and yield. What’s it been like for you?

**Anthony Bly:** Well, you know, we’ve learned about something where we’ve taken water that’s in our way and keeping us from, from doing a good job of growing crops. And we’ve turned that around and now, we’re going to try to put that back to work for us. We’re going to try to keep some of that. Keep it on the landscape and make it a benefit.

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**John McMaine:** 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.