## Conservation Drainage Complexities Part 2

## Season 1, Episode 2

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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 2.

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**John McMaine**: Welcome back everyone, I’m John McMaine.

**Anthony Bly**: And I’m Anthony Bly.

**John McMaine**: And last week, we introduced you all to conservation drainage, the different practices, and some of the pros and cons of tile drainage in general, because it’s important to start at that point, to talk about conservation drainage. So, today, we’re going to continue the discussion and dive into other barriers keeping folks from implementing conservation drainage practices and then, how we can work to overcome these barriers. Something I’m really excited about, in all of these episodes we’re doing, the future of conservation drainage. What does that look like? What’s the forward look? What do we get excited about for the future? And so, last episode, we introduced Chris Hay and Jeppe Kjaersgaard, leading researchers in the field of conservation drainage, and do a lot of application as well. We’ll hear from them again today; we’ll hear what Chris has to say about what he believes are the barriers keeping farmers from implementing conservation drainage practices.

**Chris Hay**: Those edge of field conservation drainage practices, probably the biggest one is economics. With the possible exception of control drainage, where you can get a little crop benefit from that, from managing the water and similarly with drainage water recycling. Although, the total economic picture of that is still something we need to figure out. For the most part, those edge of field practices are purely a downstream water quality benefit. There’s no real benefit back to the farmer to the landowner. And so, even at 100% cost share, there’s time and effort management involved, and potentially may have to give up a little land to put that practice in. And so, there’s not a lot of incentive, economically, to put those practices in. So, it does take someone that is willing to do it, despite not having a real incentive, economically to do so. They’ve got higher upfront costs, then say, cover crops or in-field management. They’re still kind of unfamiliar, so there’s more technical assistance needs around these practices. We need to have the funding in place to be able to implement these practices. Again, kind of a higher up-front cost. Then again, there’s a lot of time and friction work through the process to actually implement these edge of field practices.

**John McMaine**: Did that ring true to you Anthony?

**Anthony Bly**: Oh, that’s 100% true.

**John McMaine**: That struck home?

**Anthony Bly**: Yeah

**John McMaine**: Yeah. That’s something that I have never really thought about is, even if this is a 100% free… you know, 100% cost share, there’s still the resources of your time and effort, and you know, worry. Maybe not worry, but mental energy that’s being expended to think about this practice. How it’s going in, how to manage it, how to operate it.

**Anthony Bly**: There’s a lot involved and if there’s really no good incentive, I can see that being a big barrier.

**John McMaine**: Yeah.

**Anthony Bly**: Huge barrier.

**John McMaine**: So, I don’t really know how to get around that, unless we... I don’t know. What do you think? Is there any way to get around that?

**Anthony Bly**: Well, there’s got to be some type of environmental credit or something like that that can be gained or earned or something in exchange for something else. I don’t know that it has to be dollars exchanged, that can we devise a credit system?

**John McMaine**: So, even if it doesn’t cost money to put it in there’ no direct benefit and there is a direct cost because you’re still expending time and energy and management.

**Anthony Bly**: Absolutely. Time and space.

**John McMaine**: Time and space. Man, that is a real premium for a farmer.

**Anthony Bly**: Because you can use your time and space somewhere else to make money.

**John McMaine**: This is true, so there is an opportunity cost of putting something in, both in the space and in the time, because otherwise you can use that space and or time that is a net positive.

**Anthony Bly**: Correct. It’s a big issue with farmers, because they’re looking at the bottom line every day, and returns, and the question for them is, ‘Why would we do this?’

**John McMaine**: Yeah. Just because it’s free, doesn’t mean it’s a good investment.

**Anthony Bly**: Yeah, and in some cases, it isn’t even free. You know? It’s cost-share, it’s part of it.

**John McMaine**: Right. Maybe 40% or 60%.

**Anthony Bly**: Correct.

**John McMaine**: Yeah.

**Anthony Bly**: Yup. So, I think there needs to be some level of certification, or credit, or some recognition from society that the agriculture is motivated to do their part.

**John McMaine**: Yeah! So, I want to ask you about this certification idea. How much value do you think could be gained from being a, you know, certified clean water farm, or something like that? If you had some type of certification like that? How valuable would that be to a farmer?

**Anthony Bly**: Well, I think right now farms are being certified as far as their sustainability. Maybe that’s not the right word, or carbon footprint, and I think that should all be tied together with the environment. And so, farms that come certified, or become in this group, you know? They may receive higher prices for what they produce in the marketplace, because consumers want that identified with their end-products.

**John McMaine**: Right, so even if it’s not a direct credit for some type of practice implementation, you’re still getting a premium because of the value of your management system.

**Anthony Bly**: Correct. Yup. It could be tied to bioenergy, it could be tied to, you know, anything.

**John McMaine**: Yeah, makes sense.

**Anthony Bly**: And I think it’s where society can pay that. Pay it through the products. Carbon-free crackers or biofuels that are low carbon and certified as low carbon, so the consumer knows that something is going on to protect the environment.

**John McMaine**: And I’ve seen the argument, mainly on twitter, so you know, take with a grain of salt I guess, but there’s a perception that folks may not be willing to pay more for food. So, like there might not be the demand for food perceived, but I think the reality is you would find a significant market. I think we see that with organic; people are willing to pay more for organic. I mean, some people.

**Anthony Bly**: Absolutely.

**John McMaine**: Like it’s not always across the spectrum, but figuring out what the demand in the market is, could then drive incentive to put in more…

**Anthony** **Bly**: Conservation practices.

**John McMaine**: More conservation practices, love it. So, I’m an engineer by training and sometimes thought process, and Jeppe is an engineer, so one of the things I asked Jeppe is what does he see as, I said the “Tesla” of conservation drainage practices is, but basically what is kind of going to be the next big shift in the market that’s really going to drive a lot of innovation in that type of thing?

**Jeppe Kjaersgaard**: I think for conservation drainage practices, it is moving towards a higher degree of automation, and we need that because we all know that when you’re out on the farm, you get busy, and you might not have time to do the maintenance, or make the adjustments, as some of these practices might require. And so, higher level of automating how the practices work, but still keeping them very cost effective, I think is the direction that we’re moving in.

**John McMaine**: As an engineer I love to hear that.

**Anthony Bly**: Sure you do.

**John McMaine**: Because that’s something that I can get behind and I understand. What do you think about automation? What do you see as the potential for that?

**Anthony Bly**: Oh I think it’s definitely there, you know? People really like all of the precision farming tools, row control, of course the yield maps started it all off, you know? The steering, the accuracy of some of those things are getting really good, you know? We’re controlling them with our smartphones. I think automation would fit right in if, you know, it makes sense economically. It probably has to be at the top of the list.

**John McMaine**: There’s still an ROI even if it is invested for agronomic profitability. It still has to return on that investment.

**Anthony Bly**: Correct.

John McMaine: Yeah, and the thing about automation that excites me is that we are getting to the point where we have access to so much data. So, we can get soil moisture data, we can get weather data, we can get evapotranspiration data. The mesonet in South Dakota is expanding. It will be up to 150 stations by the next 5 years or so. So, we have access to all this data, so an individual taking all that data, making a decision, you know, like a once-a-month decision, that really doesn’t shift the paradigm much, it doesn’t move the needle. But if we are able to pull all this data together, run it through a machine learning algorithm to say what’s the best way we can manage the water, and then automatically managing that water. Now I think that does move the needle and we get real concrete quantifiable improvements in how we manage water, and then the result of that would be improvements to water quality downstream, improvements to nutrient-use efficiency, improvements to crop yield, improvements to profitability, so automation in, kind of, this next phase is really exciting to me as well.

**Anthony Bly**: Oh yeah, I think it could be big.

**John McMaine**: And it fits with precision agriculture, SDSU, we’re all about precision agriculture, so yeah, I think the future is bright for conservation drainage. So, Chris works for Iowa Soybean Association, so it’s a little bit of a different perspective than just a university researcher, or an agency researcher, and so I wanted to get Chris’s take on what some of the innovative projects they’re working on, kind of what his interaction has been with farmers, and others in the conservation drainage field. So this is just kind of an overview that he and his organization are working to advance conservation drainage.

**Chris Hay**: I think some of the things that Iowa Soybean has been pretty innovative or at least early to the table on. We’ve really focused a lot on water monitoring and so, we’ve got our own water monitoring, water quality lab here at Iowa Soybean. We started with some early stream monitoring to get an idea of targeting where it is that we wanted to work, where we could get the most benefit and as we did that and started to see some areas that needed some help, that needed some targeting. But, you know, that scale you really can’t tell exactly which fields, or which smaller areas are really contributing to that. So, we started to move to drainage districts and then in most drainage districts there’s more operations within those drainage districts, and so eventually worked our way down to monitoring the individual drainage outlets. So, once you get to that level, then it’s less abstract for the farmers that you’re working with, it’s their outlet and they can see exactly what their management means as far as nutrient loss out of their operations. The economic loss of that nitrogen leaving that system, but also understand the water quality impacts. It makes it a little easier to have that conversation about ways to try and minimize that loss. So, I think water monitoring has been a big one to further that conversation. We’ve also been very big on watershed planning, getting farmers together within the watershed so that they really take ownership trying to meet water quality goals for their watershed collectively. One of the more recent things we started doing is this idea of conservation agronomist. Long realized that the ag retailer network is key in trying to make a lot of this happen. Most of the surveys show that those ag retailers that they work with are some of the people that they trust the most. So, if we can engage that ag retailer network, that’s a way to try and implement more conservation, but there’s some challenges in trying to do that because they don’t want to take on any risk that might risk their relationship with those farmers and especially their sales. Come up with this idea of conservation agronomist. Someone that we either embed in an ag retailer, it could be a specific ag retailer, it could be that they’re up in a watershed area and working with the different retailers that service that area. But they come from an ag retail background, or a sales agronomy background and have that agronomy background, but also understand the conservation practices. You know, they can develop relationships with those ag retailers and then that’s a foot into the door to try and build on those relationships those ag retailers have with those farmers. So, then they can have that conservation conversation and the ag retailer can maintain their relationship with the farmers.

**John McMaine**: So, what do you think about that Anthony?

**Anthony Bly**: That’s an interesting concept. I know there are some independent conservation agronomists. You know? They’ll help farmers independently but teaming them up with ag retailers would be a real interesting concept. Kind of like a farm built by a biologist.

**John McMaine**: Sure.

**Anthony Bly**: In a way. They’re not in the retail location, but they’re helping farmers with all of those conservation type of issues.

**John McMaine**: Sure

**Anthony Bly**: Programs.

**John McMaine**: Yup. Questions.

**Anthony Bly**: Record keeping, you know?

**John McMaine**: Yeah

**Anthony Bly**: Questions.

**John McMaine**: Yeah, and again, I’m really glad of Chris’s perspective being with a commodity group, commodity organization, because it helps us, helps me, understand that it’s a way more complex system than just the science of what’s going on, you know? In the practice or in the ground. And the social science, the economics, the relationships, it’s such a

**Anthony Bly**: Trust issues.

**John McMaine**: Yup, trust in each other, trust in organizations, trust in data.

**Anthony Bly**: Yup.

**John McMaine**: Trust in ways we collect data, trust in ways data is used.

**Anthony Bly**: And then there’s money to be made. Money needs to be made.

**John McMaine**: Right.

**Anthony Bly**: That’s the essential part of it, is that money needs to be made, somehow, some way.

**John McMaine**: One thing that I thought was interesting too, that Chris will talk about in a clip here in a second, is these practices don’t just happen, right? There needs to be some work force that goes into designing and installing these practices. So, if there’s a significant demand, we don’t really have the workforce in place to put these practices in. But then why should there be a workforce if there’s no work for them to do, right?

**Anthony Bly**: Correct.

**John McMaine**: So, there is a little bit of a chicken and an egg thing right now of we can’t put stuff in because we don’t have the workforce, but we can’t have the workforce because we don’t have the work to do yet.

**Anthony Bly**: You’ve got to walk before you run.

**John McMaine**: You’ve got to walk before you run, and so I think that’s another aspect as we think about scaling up, is what are the different factors preventing us from scaling up? Some of it’s science, some of it’s education, some of it’s training, but then there’s things like yeah the economics and the workforce, it’s a complex system and a lot of moving parts.

**Anthony Bly**: I thought Chris’s comments about testing was really good.

**John McMaine**: Yeah, so does that sound like a program you’ve heard about in South Dakota?

**Anthony Bly**: Yeah, I think it’s been tried, and tempted, and it’s not dead I don’t think. But I think it’s just important to bring awareness, I think producers need to know where they’re at. Refer to nitrates in the water. A simple one. It needs to be private and confidential and…

**John McMaine**: Also, where they are at in relation to, not everyone else, but like what’s normal, what’s average, you know?

**Anthony Bly**: Correct

**John McMaine**: Seeing one number that’s your own, it’s hard to put that in context. But if you can see where you’re at relative to 50 other fields, then now you know that ‘Oh, yikes, there’s something I need to do about that’.

**Anthony Bly**: Right. I would like to bring awareness to producers is, how much water is actually going down the drainage way, or out the outlet tile.

**John McMaine**: So the volume?

**Anthony Bly**: The volume of water.

**John McMaine**: Do you think it’s more than they suspect?

**Anthony Bly**: You know, I really don’t know. I would like to get a handle on that myself, and then we can start to think about the potentials for that water and what that means.

**John McMaine**: Viewing it as a resource rather than a waste probably.

**Anthony Bly**: Sure, yeah, and how it applies to contribution drainage.

**John McMaine**: So, one program that we’ve started in South Dakota with funding from the Nutrient Research Education Council is actually a similar set up to what Iowa Soybean is doing and did, but we’re monitoring tile, taking weekly, or samples every other week, analyzing them for nitrate and orthophosphate with a two-fold objective. One is just to set a baseline of what’s going on and what’s coming out of tile in eastern South Dakota? There’s been a fair amount of research across the upper Midwest, and across the U.S. but historically in more tiled areas, I mean tile, while it’s not new in South Dakota, we have tile around that’s 100 years old, but it’s definitely seeing a resurgence. I think from 2012 to 2017, there was a 69% increase in acres tiled, so we’re seeing a huge amount of growth and South Dakota is not Iowa, it’s not Minnesota, it’s not Illinois. We have different soil make-ups and we have a different climate, and so getting a handle on what is coming out of tile in eastern South Dakota is important to set a baseline, and then once we know that baseline like Chris said, we can start identifying risk factors. So, are there certain soil types, is it completely driven by weather, is it different management, is it cropping patterns, I mean whatever the case would be once we identify risks, then we can optimize implementation of some of these practices.

**Anthony Bly**: Yeah, we’re dealing with that wet-dry line. It moves and so, it’s not as consistent farther east.

**John McMaine**: Right.

**Anthony Bly**: That makes data even more critical.

**John McMaine**: Absolutely. A nice metaphor, or I think it’s nice, I don’t know if it’s really nice, but with any hit song, you have a good baseline right?

**Anthony** **Bly**: Right.

**John** **McMaine**: Think of like “Under Pressure”.

[John sings the baseline beat for Under Pressure by Queen]

**John** **McMaine**: You know? You’ve got that baseline.

**Anthony** **Bly**: Yup.

**John** **McMaine**: Everything is centered around that; you build off that baseline.

**Anthony** **Bly**: Correct.

**John** **McMaine**: I think the same goes for water quality. Before we can build anything, implement anything, we have to set that baseline.

**Anthony** **Bly**: Mm-hmm

**John** **McMaine**: Where are we at, and where do we want to go, and how do we get there?

**Anthony** **Bly**: Same with conservation drainage.

**John** **McMaine**: Yeah

**Anthony** **Bly**: Quantity, when…

**John** **McMaine**: Yeah

**Anthony** **Bly**: When does it occur and how much?

**John** **McMaine**: Yep. So I agree with Chris, I think monitoring is very important for just understanding what’s going on, and then like you mentioned Anthony, it’s important to kind of raise the profile in the minds of the public, in the minds of farmers, of what’s in water, what’s the timing, what’s the amount? Helping individuals get a better handle on what’s coming out of their tile.

**Anthony** **Bly**: Yup.

**John** **McMaine**: Yeah, so I wanted to dig in a little more with Chris and kind of get the feedback, and how the conversations gone from when they introduce the idea of sampling tile.

**Chris** **Hay**: There’s some that just don’t want to know or just don’t care, and that’s real, and we see that, but I think probably the majority has some interest, has some curiosity wanting to know what’s leaving out of their outlets. Again, you know I think part of that’s just if they’re losing Nitrogen, they’re losing an asset, losing a benefit, so if they understand that then they can think about ways that might look at management changes to try and change that. And again, there’s others that are truly concerned, that want to positively impact water quality, and so you can’t really manage that unless you know what it is that you’re trying to manage for. We’re doing a survey with that annual report that we send out that we send back to the farmers and there was about 1/3rd of farmers that said they had made some changes or that they were considering making some changes to their practices.

**Anthony** **Bly**: I think that’s encouraging.

**John** **McMaine**: It means that people are aware and interested in the impact they have and can have, and want to do something about it.

**Anthony** **Bly**: I think we need to, you know, try to get across that we don’t share that information, and that we do everything we can to prevent it from being shared. Of course, there are legal proceedings that can come into play sometimes, but we’re doing it for the producer.

**John** **McMaine**: Yeah, whenever I’ve introduced folks to the program here in South Dakota, that’s how I’ve talked about it. And yeah I’m interested from a research and scientific perspective but I’m interested because of the implications it could have for that producer in a positive way. The more information they have, the more opportunity they have to manage their system in a way that, you know, improve profitability, reduces nutrient loss. That’s really the bottom line for that situation and it gives them an opportunity because of additional information.

**Anthony** **Bly**: I think it’s positive all around. If the nitrate levels that are in their tile are adequate or low, that’s good. If they’re too high, that’s not bad either because then we can start addressing what we can do to maybe reduce some.

**John** **McMaine**: Right.

**Anthony** **Bly**: And save that money that you’re talking about.

**John** **McMaine**: Right.

**Anthony** **Bly**: Knowledge is power.

**John** **McMaine**: And lack of knowledge is how…

**Anthony** **Bly**: It’s chaos!

**John** **McMaine**: It’s chaos if you don’t know, then anybody can make an assumption. Like anyone can say what they want, and if there’s no data to say otherwise…

**Anthony** **Bly**: Correct.

**John** **McMaine**: Okay, so we’ve done a lot of research on conservation drainage, we’ve done a lot of research on edge-of-field practices, in-field practices, how they affect nutrient loss. I mean, I would say we have a ways to go on, kind of, optimizing systems and developing decision support tools. So, there’s a fair amount of research that could be done still, but we’re also kind of transitioning into this implementation phase, like we’ve researched, we’ve demonstrated, now let’s get these practices in the ground. Even though these systems are pretty simple and straight forward, you still need some design aspects. You still need skilled workers to implement these systems, so we need a workforce that can, that is equipped to be able to put these practices in the ground. So, it’s a little bit of a chicken and an egg thing, and Chris really said this well, so I’ll let him talk about that.

**Chris** **Hay**: Definitely a chicken and an egg thing, that right now, probably the biggest issue is we just don’t have enough demand but if we create demand, there’s not the supply right now either. So, it is kind of a balancing act that we need to be able to ramp up the supply, but we also need to know the demand is going to be there when we’re doing that. So, it’s a challenge right now on both fronts to try and increase demand, but also ensure that supply is also going to be there when the demand does arrive.

**John** **McMaine**: So, we need the workforce to be able to put the practices in, but we can’t really train the workforce if there’s really no work for them to do.

**Anthony** **Bly**: Correct.

**John** **McMaine**: Who is going to get into a job where there is no guarantee that they’re going to be able to work?

**Anthony** **Bly**: There’s no demand for it.

**John** **McMaine**: And so, that’s a challenge. That’s probably a challenge with any new industry honestly. And the other thing about the workforce, and I’ve seen this in other applications, so in stormwater, and managing water in urban areas, but if you take folks that aren’t properly trained, then when they implement a system, it may be more likely to fail.

**Anthony** **Bly**: Correct.

**John** **McMaine**: An example I’ll give is for a rain garden, or a bioretention cell. Now a bioretention cell in urban stormwater that is driven solely by infiltration. A typical contractor, if they were just doing landscaping, they would go in there, they would drive their equipment through the bioretention cell, you know?

**Anthony** **Bly**: Compact it.

**John** **McMaine**: Yeah, exactly! So then, you end up compacting the soil, so now this system that’s supposed to work by infiltration, doesn’t work.

[laughing]

**Anthony** **Bly**: Overflows.

**John** **McMaine**: It overflows, and you have this nice, say the city of Sioux Falls put in this nice bioretention cell, contractor didn’t do a great job and it’s a…

**Anthony** **Bly**: It’s a cesspool!

**John** **McMaine**: It’s a cesspool and then that’s an eye sore and that’s an example of why we shouldn’t put these practices in. And so, if we have a workforce that isn’t adequately trained, then every practice they put in, say they put in a bioreactor, it has a lot of sediment in there, it clogs within the first year. Well, now that’s an example of ‘yup, bioreactors don’t work because they clog’ when in reality, it was a workforce issue or a training issue. I shouldn’t say it’s a workforce issue, it’s a training issue, and so you need a sufficient workforce to be able to put the practices in and simultaneously, you need the demand to be able to put in, but then you also need training for the workforce to be able to put it in well. So, it’s a lot of things that kind of need to converge at the same time.

**Anthony** **Bly**: It’s complicated.

**John** **McMaine**: It’s complicated, it’s a balancing act like Chris said. So, I asked Chris what’s the future look like, what’s the next frontier for conservation drainage, I’ll let him talk about that.

**Chris** **Hay**: I think probably, the frontier right now on conservation drainage and edge-of-field practices in particular, to me really revolves around a finance, you know? Conservation finance and market-based solutions. Unless there’s a big change in federal funding, in state level funding, we’re only going to get so far with cost-share on these practices. And so, we really need to look at other ways that we can finance these practices and address that back that there should be an economic incentive to the farmer or the landowner, to put these practices in. You know, I think if we come up with ways we can put together buyers and sellers of these ecosystem services, water quality being one of those ecosystem services, then that’s a way that those farmers and landowners can actually capture some economic benefit of putting in these practices. I think there is some movement on that, it is early days, but the more we can add in some of these market-based solutions, I think that’s really a way to scale up implementation of these practices. One of the things that we need to do then is, to really support that, we need to come up with better ways to model what the expected outcomes of these practices are, you know? Kind of cheaper, easier, and effective ways to monitor, track, and verify those outcomes. Kind of, more day to day, I think building out some more of these decision support tools, I think there’s a lot of work yet with the technology and the tools to help with implementation and practices, but it’s probably more short term right now.

**Anthony** **Bly**: It’s all about the money.

**John** **McMaine**: It’s all about the money. Markets, finance

**Anthony** **Bly**: Ecosystem services, Chris explained that well.

**John** **McMaine**: There’s thing we can do to directly measure, like, yield or treatment cost, but these practices do have real value, it’s just really hard to quantify sometimes.

**Anthony** **Bly**: Yeah, and who is going to and who wants to pay for it?

**John** **McMaine**: Right. And, if you have a system that’s stuck with one buyer and one seller, or one buyer and a lot of sellers of these credits, then that money is not sustainable. You know his point about federal and state funding decreasing, honestly, I mean, I don’t even want to count on a cost-share from a federal program.

**Anthony** **Bly**: That’s just got to be built into our system somehow.

**John** **McMaine**: Right and maybe it is a way that we start with a certification type process, to be able to acknowledge that other factors were considered than just yield, in the production of this product. Then, you can pay a premium for that, or you can ask a premium for that, and then you get demand and then you’ll have the supply side that’s going to build up to meet that demand. So yeah, I think that’s a really important path to go down. Some way, somehow, a market-based solution.

**Anthony** **Bly**: Correct.

[music]

**John** **McMaine**: Thanks for joining us today on Streamlines. We sure had a lot of fun, 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**: And I’m Anthony Bly.

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