University of Minnesota Nutrient Management Podcast Episode “2020 research update”

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(Music)

Paul McDivitt: Welcome back to University of Minnesota Extension's Nutrient Management Podcast. I'm your host, Paul McDivitt, communications specialist here at U of M Extension. Today on the podcast, we'll review 2019 research and look ahead to 2020. We have five members of extension's nutrient management team, Dan Kaiser, Brad Carlson, Anna Cates, Vasu Sharma, and Jeff Vetsch. Can you each give us a quick introduction?

Brad Carlson: Brad Carlson. I work out of our regional office in Mankato. A lot of folks know me for doing Nitrogen Smart.

Dan Kaiser: Dan Kaiser. I'm a nutrient management specialist. I'm located on the St. Paul campus.

Jeff Vetsch: Jeff Vetsch. I'm a researcher and social scientist at the Southern Research and Outreach Center in Waseca.

Anna Cates: Anna Cates, soil health specialist here on the St. Paul campus.

Vasu Sharma: Vasu Sharma. I'm the irrigation specialist at St. Paul campus.

Paul McDivitt: All right. Before we get started, I'd like to quickly mention that we have a few upcoming events. Our annual Nutrient Management Conference will be held on Tuesday, February 4th in Mankato, and our annual Nitrogen Conference will take place on Tuesday, February 18th at Alexandria. You can pre-register for both of those events on Extension's website. Just go to z.umn.edu/NMcon2020 for the Nutrient Management Conference and z.umn.edu/Ncon2020 for the Nitrogen Conference. Also Extension's Nitrogen Smart program is happening at 14 locations across the state this year. You can see all of the dates and locations at z.umn.edu/nsmart.

Brad Carlson: Slash Nitrogen Smart.

Paul McDivitt: Nitrogen Smart. Okay.

Brad Carlson: Slash Nitrogen Smart all one word.

Paul McDivitt: I think they both work, but-

Brad Carlson: Do they?

Paul McDivitt: Maybe.

Brad Carlson: Good to know because I've never used N smart.

Paul McDivitt: All right. Anyway, starting off, can each of you give us a brief update on your research? What happened in 2019 and what will you be doing in 2020.

Dan Kaiser: Well, 2019 interesting year. I'm actually surprised that we got as much done as we did, particularly for fall field work. Everybody with a lot of growers to scrapping and I was kind of amazed driving up to Fargo recently, looking at the amount of corn that's still up in the field around there. And even the Southeast thing. I think Jeff in south central. There's still some fields that haven't been harvested. So we had a number of trials going in around the state. The biggest one that he started last year was a longterm sulfur trial. Looking at some dynamics of sulfur utilization, looking at some different sources and trying to figure out when some of these products become available. So that was kind of an interesting study. Saw some things that I didn't expect, particularly with the elemental sulfur sources at one of the locations, one of my co-granulated products did better than the sulfate, which I haven't seen in the past.

Dan Kaiser: And doing some work on that. I'm going to be talking about here at some of the meetings focused on looking at kind of what's happening in the soil too that we kind of can start tracking what's happening for availability over time. So kind of an interesting looking at that and some of the other things too, the yields were pretty decent across many of the locations. The thing I could have done without this year was either wind damage, either it was a green snap early in the season. I know Jeff, you guys experienced some of that and then also we had high wind event out in the western part of the states around towards I think the end of September, early October. That blew some of our crops down and that was probably the big thing, but some interesting results this year and hopefully we'll have few more podcasts here this this winter just to talk about some of the things that we've been seeing.

Jeff Vetsch: Yeah, Waseca, we had our typical run of nitrogen trials including the urea timing that I work on with Fabian Fernandez and we had some several manure management trials that I was working with Melissa Wilson and her grad students and postdocs and those trials actually were quite interesting and actually turned out quite well. Urea timing was no surprise in a wet year where we had 48 inches of annual rainfall and 30 I think it was 32 or 33 inches of growing season. Precipitation, fall urea treatments perform quite poorly compared to spring application in south central and southeastern Minnesota. It was a good year for split application of nitrogen. Our split applied treatments in

the majority of the studies that over 50% had a yield advantage. We set up our AFREC band K and band phosphorus. We had it in soybean last year. I'm looking at kind of residual effects and responds to soil test P and K. We put on our treatments for the fall of 2019 for the 2020 cropping season. So we'll look at band P and K applications across a wide range of soil test levels in corn in 2020.

Anna Cates: Great. This is Anna and last year was my first year in the state so I spent quite a bit of time just going around getting to know people and one study that, let me do that was a big conservation innovation grant. We've been working on doing on farm research in four different regions around the state, looking at soil health tests and kind of more soil health minded conservation minded systems and conventional systems on the same soil type. So we have some preliminary data we're going to bring out to the farmers in March to show them how things looked so far. But there were some interesting sampling days for that too. I got my boots pretty muddy a couple times. I also was working on a little pilot project tracking the relationships between soil health tests and temperature and moisture levels, and I'm going to continue that in 2020 because it does seem to matter, your microbes responded temperature and moisture and so your soil health tests also respond to the temperature and moisture of the soil.

Anna Cates: It's going to make a difference if you sample on a wet day or a dry day. The other thing I'm excited about, we just found out we got funding to track the mineralization of organic matter in newly drained plots up in Crookston. AFREC's going to fund that this year. So I'm working with Lindsey Peas to figure out how much mineralization of carbon and nitrogen and other nutrients you can expect right after a drainage event. And I'll be starting to test some cover crop systems in sugar beets in west central and northwest Minnesota that starts this fall with putting in cover crops for the 2021 beet crop.

Vasu Sharma: Yeah, a very interesting ear for irrigation research in Minnesota. So in 2019 we started irrigation and nitrogen interaction study at Becker Research Farm in Becker, Minnesota. And actually we found very good and interesting results because the year was very wet, but still we irrigated around six inches and our 100% irrigation plots. And we found that actually reducing irrigation rates in wet years is more beneficial than applying 100% irrigation. There is no statistically any year difference between 150% and in terms of nitrate leaching, 50% actually work better than 100% irrigation treatment. So this study is mostly focused on how irrigation rates and nitrogen rates interact with each other and how they impact water quality and crop yields. This was the first year we'll be continuing this study for next three years and now we have the funding to do this study in other location as well. So we will be doing this in two locations in Minnesota to capture more variability in rain.

Vasu Sharma: The other study that I started last year was looking at different irrigation scheduling methods and comparing these methods. I think the main challenge that farmers face, in terms of irrigation management is they don't know what kind of irrigation scheduling is best for their field, for their region. So I compared

for irrigation scheduling methods ranging from measuring soil moisture in field to using some kind of crop models and we found very interesting results, which I'll be presenting in the next conferences that where I'm talking.

Vasu Sharma: Other than that in 2020, I'll be continuing both of these researchers as well as I'm more focusing now on looking at different soil moisture sensors and comparing them. The recent survey that USDA did in 2018 showed that only 11% of growers in Minnesota use soil moisture sensors for irrigation scheduling. We want to increase that number for irrigation management. I think the main barrier is that people don't know what kind of soil moisture sensor is best for their field, for their soil type. So the focus of this study would be to look at different soil moisture sensors in different soil types and find out what is most easy to use. Simple method and most accurate. So, yeah, that's going on.

Brad Carlson: Well, being an extension educator, I don't have a large portfolio of research projects. One thing that I have been working on the last couple of years is an evaluation of variable rate nitrogen technologies and the last year was a very interesting year for looking at that because with as wet as it was and as cold delayed as the growing season was, we finally had some conditions that would indicate some challenges as far as how much nitrogen is mineralized during the course of the year, as well as how much nitrogen is lost either through denitrification or leaching. We've got a lot of experience using the variable rate technologies under ideal conditions and we've found decent success in that frequently under ideal conditions. The technology just simply tell us to apply less nitrogen, which is what we would expect is really the situations where it's telling us to apply more nitrogen than what we might normally apply that we're kind of questioning how accurate these things are.

Brad Carlson: Unfortunately at this time we've had some snafus in data analysis. I've got the data and we finally cleared our last hurdle. I should have results, yield results here by the time we do the nutrient and the nitrogen conferences. The one thing though that is interesting as we've been comparing a couple of different prescription methods, particularly crop models, is in the heavy textured soils, we saw a divergence of some of the models between, we had one commercial product we use that actually told us to apply significantly less nitrogen and one that told us to supply a significantly more nitrogen in the exact same spot. And so I think you've got a divergence between one of them wanting to favor nitrogen loss because of how wet it was and the other one wanting to favor decreased crop growth and potential because of how wet it was in that location.

Brad Carlson: And so then the question becomes is, which was correct. And so that's, we'll get some data for that soon. But at this point it's interesting to know, and that's been one of our takeaways with a lot of the variable rate technology the last few years anyway, is when you're able to compare a different products on the same field, you'll get different recommendations. And so we're not ready to pass benediction on who's correct and who's not. But it's obviously worth noting if you're investing in one of these technologies, you've made a decision which

one you think is correct and it's worth knowing that other products will give you different recommendations.

Brad Carlson: Coming into 2020, I guess probably the most significant thing I'm dealing is working with Dan on a project that's going to continue to refine our use of soil nitrate test, both a pre-plant and I've been working on various things involving the side dress test. I'm not sure the extent to which we'll probably find out a lot that we don't already know. You know Jeff and I worked on a project several years ago on that, but that's also a component.

Dan Kaiser: Yeah, and I forgot to mention that because I've got three locations that we'll be putting out this year. We were trying to do is look at the pre-plant test and the reason I'm looking at that, I know it's an oldie but goodie. A lot of people don't like to take that sample, but when you start looking at it, the reason I'm looking at it, because I think it's something that we can use to make the decision sooner than later. We have a lot of research going on right now with sensors and some of these models and a lot of those times those are more reactive and we're looking at later applications and just our time window hasn't been that great in the spring. So what my thought is at least with the pre-plant nitrate test, is that something we could be making the decision as that crop is being planted. If we have the data there and then start making a decision to side dress right after we can roll the corn. So it gives us some additional time.

Dan Kaiser: So we'll see what happens. The three locations we're targeting mostly south central and south eastern part of the state where that traditionally hasn't been used. That was my thought. We do have some guidelines for it for that. So will be interesting to see what happens because variable rate in, I know it was a big topic and I haven't seen anything consistent for that gives us a consistent answer in terms of what to apply. But the models, I know some Brad that's what you've been doing, it looks interesting. I think a lot of growers will have to get a grip on it though when they consider our recommendations to not be high enough when some of these models recommend less. Are they comfortable with that?

Brad Carlson: Right. And then there's an overarching question to that, that it's a philosophical one and that is if you needed less nitrogen and we know just simply from nitrogen rate studies that you've very frequently max your yield or your economic optimum, your yield at economic optimum nitrogen rate at a rate that's a lot lower than what the overall recommended rate is because of the way the model is. So the question is, did the model accurately predict that or did it just find something that was already in the dataset anyway? That you could have gotten away with last nitrogen and again, without knowing the coding and the models, we don't really know how they're coming up with those numbers. All we can really do is run the models over a number of years in situations and just see how they perform.

Paul McDivitt: All right, so what will each of you be presenting on at the Nutrient Management Conference and the Nitrogen Conference?

Vasu Sharma: I'd be presenting results from the studies that I conducted to 2019 and talking more about how we can better manage irrigation in conjunction with other management practices like nitrogen and nutrients in Minnesota. Other than that, I'll be talking in general about soil moisture sensors and other technologies that we have in irrigation management.

Paul McDivitt: And that'll be at the Nitrogen Conference, right?

Vasu Sharma: Yes. That's the Nitrogen Conference in Alexandria.

Paul McDivitt: Okay. Anna.

Anna Cates: Well at the Nutrient Management Conference, I'll be talking about the Haney test, which is a popular soil health test with Liz Stall. She has a great set of on farm data. Looking at the Haney test's ability to recommend fertilizer applications accurately and then I'll also be presenting data just to give growers a sense of if they are using it, what's normal for Minnesota? We have a good batch of data for that. At the Nitrogen Conference, I'll be talking more generally about cover crops and nitrogen additions. What you're going to expect from your cover crop residue breakdown in terms of carbon and nitrogen ratio, what you might plan for in terms of nitrogen application. If you're following a cover crop.

Jeff Vetsch: At the Nutrient Management Conference in Mankato. This is Jeff. I'll be talking about our drainage study and cover crop interactions. That's a study that started initiated in the fall of 2016 where we oversee the cover crops in soybeans. We've had two years of growing corn, one year of growing soybeans, three years of establishing cover crops. The first year, the fall of 16 going into 17 we got a pretty good establishment of our cereal rye. We'd let it go until the spring. In April when we terminated it, planted corn, we had a very nice reduction in nitrate concentration and load that year. It was a good scavenger of nitrogen coming out of that previous soybean crop. In 2018 some of those treatments carried over into the soybean phase. In 2019 we had very poor establishment at both of our annual and cereal rye winter covers. We still had a very, very small could be significant reduction in nitrate concentration range. Still have to do all the statistics on that data. I'll be presenting on that at the conference in Mankato.

Dan Kaiser: So this is Dan. At a Nutrient Management Conference, what I'm going to be talking about are some of these bio stimulant products. The main focus just talking through some of the different classes of products and what they're meant to do. I may work in I have done some testing, some older work with Accomplish LM, which I may end up talking a little bit about. It falls in those

categories and recently at a couple of sites out, actually 2019 looking at this product called PROVEN by Pivot Bio, so nothing groundbreaking at this point on those.

Dan Kaiser: Again, a lot of those kind of limited in terms of the number of trials, but I'll talk just a little bit more about some of these things and kind of what growers should be looking out for. At the Nitrogen Conference, my main focus is going to be just talking about our guidelines. Just kind of working out how we come up with the nitrogen guidelines, how we create them and just what's behind them. It's a some similar things I know where we'll be talking about for Nitrogen Smart, but we'll be expanding more in that with our advanced Nitrogen Smart topic with our deep dive into the four hours. But I'll just kind of be covering some of the basics of the guidelines at the Nitrogen Conference this year.

Brad Carlson: And I'm on the panel discussion at both locations, which is going to be kind of... It's a conversation really with the audience regarding experiences from the past year and so obviously the topic being nutrient management, a lot of what that'll focus on is the issues with doing timely field operations, problems with actually getting a product applied. And then of course we had experiences relative to how what the growing season was and delayed and so forth. Lot of situations where we had good response to side dress because of loss of other applications and so forth. So that's a big part of at both locations. At the Nitrogen Conference, I'm giving a presentation and it's a really kind of a vague title. It just says a Update on University Nitrogen Research or something of that sort. The idea behind that I think is primarily that Fabian Fernandez, who was our primary nitrogen specialist is on sabbatical right now and so he's done a number of projects looking at a nitrogen source and timing and so forth.

Brad Carlson: So I'm going to be kind of giving a little overview of some of that information since Fabian's not around. We'll be talking a little bit about the variable rate stuff that I've been doing and I think the idea also Jeff, whether you knew this or not, was to bring some of that drainage stuff also. So if I throw about three things and try and get that done in 40 minutes, I'll be doing really good.

Paul McDivitt: So why should growers and crop consultants attend these conferences and our Nitrogen Smart program?

Brad Carlson: Well, I'll start with the Nitrogen Smart one. That really is focused on farmers, crop consultants, AG professionals are welcome to attend that. That program is really those targeted towards farmers. It's funded by the corn growers. The whole issue with Nitrogen Smart and the mantra that we have for Nitrogen Smart, we tell farmers when they come in there is we're not going to tell them what to do. We're going to give them enough information. They can decide for themselves what to do. And so really with this challenging as the last couple of years have been, it really kind of emphasizes that point.

Brad Carlson: We present basic information about how nitrogen behaves in the environment and then how you make management decisions based on that, both in terms of what our university recommendations are, the best management practices are as well as the research behind that. And then the conditions where that applies as well as the conditions where it doesn't apply. So try to decide where to flex your management. The advanced Nitrogen Smart that we're doing in the afternoon is just getting into a lot higher level of details. So I think just beyond knowing I might have lost nitrogen, I need to apply more or my conditions are ideal. I could probably apply less and so forth. Or do I need to change a practice? Because this actually isn't a good practice.

Brad Carlson: We're really going to try and go into a lot more detail of really narrowing down just what it is you do, where and when, what kind of rates you apply and getting to a better idea of actually being able to identify the rates and practices on a year to year basis based on conditions. Now that's not a perfect science because you can't ever predict how the rest of the growing season will go, but again, you'll feel at least understand the research and the science, then you can start making better decisions like that. So that's really kind of Nitrogen Smart in a nutshell. As I mentioned, AG professionals are welcome to come if they want. We don't offer CEU, so if you want those, you'll have to self-certify.

Dan Kaiser: Yeah, and on the other two conferences, one of the things that we've seen less and less as in-person offerings from really, oh Jeff could probably speak to this a little bit. The Southern Research and Outreach Center still does a winter crop stay, but not all of the research outreach centers do. So the opportunities to get or to at least have growers and consultants come in have kind of dwindled. We do tend to still maintain the CPM short course and the AG professional updates, which I know are very well attended. But I think the idea if you look at the other two conferences were just to do a good job with one day event to see if you really want to come learn on a specific topic. That's really what those two, the Nitrogen and the Nutrient Management Conference are geared towards and the way those usually split is kind of bottles where the Nitrogen Conference is mostly now it's all nitrogen focused and the Nutrient Management Conference then is more broad topics.

Dan Kaiser: And the thing I like I guess about these in particular is we're bringing more people in like Anna and Vasu that have different perspectives. They aren't just the hardcore recommendations, this is what you should apply. There's some different alternatives, particularly the soil health top realm because we get a lot of questions on that from growers and there's a lot of information floating around in all these print publications and I wouldn't want to be a grower right now because all the information they're getting in terms of what they want to do. So it's nice to have and be able to come and hear some of the local experts talk a little bit about that are maybe more consistent with conditions that they're going to be dealing with.

Jeff Vetsch: Yeah, and just to elaborate on what Dan said, I think the big advantage that I see too is our CPM short course and the research update for AG professionals, which is just concluding today in Crookston, they cover agronomy, weed science, plant pathology, entomology all of those things. And soil science is just a part of it where these programs are really focused on soil science, soil fertility and water quality issues related to nutrient management. I think that's the main reason.

Dan Kaiser: Yeah. And the other thing bringing some other people in too, I mean we also bring some agency people in too on some of these, which is really nice because I think there's kind of gets to be a divide sometimes putting growers and some of these agencies in terms of some of the regulations coming down. So it's nice to kind of have just the open dialogue and have just all the topics we have there and bring it together and kind of talk about what the issues are and I think educate more than just growers and educate kind of more the people that are working in the AG sector across the state, whether they're farmers or in some other sector to kind of what some of the new research says in terms of what should be done in areas of the state.

Brad Carlson: You know, one of the other areas without getting real specific about the extension versus what private industry does, we do have to acknowledge that on the nutrient management side, the fertilizer side. Fertilizer is more or less a commodity. We don't see brand differentiation between who manufactured the fertilizer and so forth and as you do with pest control products and so a lot of the educational offerings you'll find from a dealer, a co-op and so forth, that tends to focus on the the pest management side because you've got companies supporting that kind of outreach with their products and they'll do a little bit on nutrient management but there's probably not as much of that opportunity out there as there is on the IPM side on herbicides, insecticides, fungicides. And so we kind of fill the void on that too.

Anna Cates: That's right. There's nobody to speak for the soil but us, I guess as Jeff said. Yeah, I guess I would agree with what everyone else said that this is just a great opportunity to get face to face with your researchers at the state level. You know, if you want a question answered, this is your chance to ask us that live and in person. Put us on the spot and make us uncomfortable up there under the floodlights or corner us at lunch or what have you. I mean, you could always write us an email or call, but there's nothing like a good face to face interaction for that kind of thing.

Vasu Sharma: And it's not only about educating, it's having an open dialogue between researchers and growers and consultants, and they can also give us ideas what research we should be doing so that we can include that in our programs.

Brad Carlson: And you most likely can find CEUs in soil and water too.

Anna Cates: That's right. It doesn't hurt.

Paul McDivitt: All right. That about does it for the podcast this week, we'd like to thank the Agricultural Fertilizer Research and Education Council, AFREC, for supporting the podcast. Thanks for listening.

(Music)