

University of Minnesota Nutrient Management Podcast Episode “Considerations for fall fertilizer applications”

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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're talking about fall fertilizer applications. We have three members of Extension's nutrient management team, Dan Kaiser, Jeff Vetsch and Brad Carlson to cover the basics and beyond.

Paul McDivitt: Welcome. Why don't you each give us a quick introduction.

Dan Kaiser: This is Daniel Kaiser. I'm a nutrient management specialist with University of Minnesota Extension located out of the St. Paul campus.

Jeff Vetsch: Hi, I'm Jeff Vetsch. I'm a researcher at the Research and Outreach Center here in Waseca.

Brad Carlson: Brad Carlson, Extension educator. I work out of our regional office in Mankato and work statewide.

Paul McDivitt: All right. Starting off, given the conditions this spring, if fertilizer was applied to a field which didn't end up getting planted, does fertilizer still need to be applied this fall for the 2020 crop?

Dan Kaiser: Well, I think a lot of this, you know, we get this question a little bit with these prevent plant situations, particularly in years where we have fall fertilizer applied, which, you know, it'd be interesting to see this spring because there was a lot of challenges last fall, which actually may not be a bad thing for a lot of the growers who didn't have a lot of inputs in and some of these fields that didn't necessarily get planted. But looking at P and K, one of the things that tends to come up is availability, and depending on where you're at, we know that availability of P and K, you probably aren't going to have too much of an issue if it was applied, say, fall of 2018 for the 2019 crop and there was no 2019 crop there.

Dan Kaiser: I'm less worried, particularly with phosphorus, if you're dealing with more acidic soils, you shouldn't have too much of an issue that should still be there. So that's one of the things I think to consider going into fall 2019 is if there are fields out there that were applied fall '18 with no crop on them and even

sooner, that P and K's probably there, so there's less likelihood that you're going to need to be putting something on for those particular crops.

Jeff Vetsch: And even if the growers decide to use a cover crop, that cover crop is not going to utilize or take up all that P and K. So it's still going to be available. If the farmer's considering planting corn the next year, the big question would be nitrogen and possibly sulfur that could have moved.

Brad Carlson: Yeah. I don't know how many guys got nitrogen put on and then weren't able to plant a corn crop. I would guess there's probably a few of those circumstances, but in general it's not very likely that you're going to see a lot of that nitrogen stick around. This is an instance, though, where you definitely want to be planting a cover crop, and particularly under that circumstance, and maybe it's a little late to be making that decision anymore, but I really would have liked one of the root crops, something like a radish or so forth, that's going to probably do a better job of taking that nitrogen up. It always becomes questionable as far as what we can actually carry over to next year. That's one of our general questions we've had with cover crops, is whether they're able to scavenge nitrogen out of the soil and retain it for the next growing season.

Brad Carlson: But I guess really all we can do at this point is try to capture it, and then we can wait until, see what the fall looks like and wait until what spring looks like, and remember that the loss processes of nitrogen are water based. And so from that standpoint, if you applied nitrogen, you didn't get a cover crop established, the odds of any of that nitrogen still being there next year aren't very high.

Brad Carlson: In addition to that, the methods we have for accounting for that primarily being taking a soil test, again calls into question whether that test is going to still be accurate. Definitely with as wet as it is, if I'm going to do a soil test for nitrates, residual nitrates, want to delay taking that sample until as late as possible, being as soon before fertilizer application in the spring. I probably wouldn't, even in the western part of the state where we typically say you can take a fall soil nitrate test with as wet as it is, I still would question whether that number is going to still be accurate by next growing season, and therefore I would still try and avoid taking and using a test until next spring and then potentially adjusting from there.

Brad Carlson: But I guess we do have to wait and see how the weather plays out between now and then to see whether we're going to actually be able to take some sort of a nitrogen credit.

Dan Kaiser: Yeah, and Jeff brought up something I think that could probably elaborate a little bit on is the uptake with some of the cover crops and even some of the weeds that are out there. There are weeds out there that you have had and you're working them back in. A lot of the nitrogen, if you haven't applied, it's probably been taken up by that biomass too. So likely not a lot there. And with P and K we don't tend to see a lot of phosphorus taken up, particularly in plant biomass. It can depend on species, but overall that should still be there.

Potassium's probably going to be the bigger question mark. But with the time to kill, if it's early enough, particularly if you've got plants that tend to decompose rather fast, you should get some pretty quick return of that potassium.

Dan Kaiser: And we see that with soybean in particular compared to corn, which corn is tougher residue. So looking at that in terms of return, I don't think that's going to be too much of an issue at this point. The question would be going into spring, again, will be more of these fallow syndrome circumstances. We know of fallow syndrome, essentially what it is is the plants like corn, which have a relationship with mycorrhizae, which mycorrhizae helped them take up phosphorus. We can see issues in situ where you have plants out there, you have a fallow situation with no plants out there, with colonization being an issue of mycorrhizae, but you can see some phosphorus deficiencies early in the next growing season. The thing about fallow syndrome, though, is you can't apply broadcast really to correct it. So I wouldn't be adjusting my rates to try to correct that.

Dan Kaiser: That's more of a banded issue where we have to look at starter or some other things if that does come into play. So that's one of the things that I think will probably come up, and we'll look at some news releases probably going and coming in sometime into September, talking a little bit more about planning for that into next year. We do see circumstances with fallow syndrome show up with corn following sugar beet, but looking at a lot of fields, I think it's probably less than 50% of the time we see that that's a problem. There's some fields out there, but it isn't always that we were going to get fallow syndrome showing up if the conditions are what we're planning, that would favor that potentially. So I think that's one thing that might come up, but I wouldn't be looking at making any big adjustments for that.

Jeff Vetsch: One variable that could come into play for P and K availability for the next growing season is if the grower chose to choose a cover crop that was going to be made for forage and removed from the field. Then the potassium removal in that forage could be somewhat significant, but if they're not removing that forage, or not removing that cover crop as a forage and they're just going to let it go back to the soil, then it wouldn't be a factor.

Brad Carlson: So the last time we had significant prevent plant acres, and I believe that was in 2013, is that right? One of the farmers that I've worked with a lot doing precision ag work, had some fields that he didn't get planted that year. And we were looking at his yield maps from 2014 from the following year, and one of these very large fields, they had only been able to seed about half the field with a cover crop. And they planted the radishes, the deep radishes, tillage radish if you will, and they saw a 30 bushel an acre yield advantage where they had the cover crop versus where they didn't get anything planted.

Brad Carlson: Now it was way too post mortem to go out and investigate. It was probably a combination of improving soil tilth which, of course, wet conditions will lead to compaction. The cover crop will help alleviate that. It was avoiding the fallow

syndrome Dan just talked about which, of course, that was not necessarily a yield increase where the cover crop was, but a yield drag where it wasn't. But then there probably was some recycling of nutrients that also came into play there. There's not a lot you can do management wise to account for that situation other than to just be aware that that is something that we've observed in the past.

Dan Kaiser: Yeah, with radish, I mean that's one of the things I've been, they are a non-host crop, so I don't think the fallow syndrome, I mean you're looking at a potential for after radish, but I think what Brad said with compaction is a big thing because as wet as we've seen the fields the last few years, we are looking at a lot of the operations being done at less than optimal times. There's a lot of compaction out there, so probably been a good idea in some of those fields, if you had compaction issues, maybe to look at something like the tillage radish, if you could have got it out this year for a cover crop to try to help with some of that.

Brad Carlson: And I think that you still could. I realize that we've passed some deadlines for planting cover crops, but I think there still is the ability to go in and plant those. We don't see great growth from radishes and turnips and those sorts of things when they're planted in, say, September, but they do grow some while it's still July, so we will, and especially as wet as it is, there should be adequate moisture. We still can see pretty significant growth of those things through the end of the growing season. And so I think it's still worth investigating versus saying, yeah, my weeds are my cover crop. I'm not sure that's a good plan.

Paul McDivitt: Is there anything new related to nitrogen which growers should be considering for fall application, considering our recent wet growing seasons?

Brad Carlson: Well, one of the things that's been coming up, and this actually came up at a field day I spoke at this past week, a farmer was asking me if the current situation isn't maybe a commercial for doing split application. And then he said, "Boy, this would have been a good year to have applied a nitrification inhibitor," to which I said, "Well, maybe on the first one and probably not on the second one." On the subject of the inhibitor, I asked when he did his nitrogen application and he said, "Well, about the 1st of May." And I said, "You know, really, you're not going to get a lot of advantage out of that." Nitrification inhibitors do wear off, and the warmer the soil temperatures are, the faster they wear off. And again, it goes back to this issue of, what is the amount of time and what is the risk of losing the nitrogen between the time you apply the nitrogen and the time the crop needs the nitrogen.

Brad Carlson: And in that particular instance, it really wasn't that great of a period of time with respect to as wet as it's been. Obviously there's a good chance of some denitrification as well as some leaching. Although, if you're looking at six weeks, I'm not sure you're going to completely be moving all that nitrogen down into the drain tile in just six weeks. It'd have to be pretty extreme. And of course, playing into that is, if it's really that wet, what do you really have left for a crop

to be investing in? And that's also an overarching thing we always have to think about. But probably the key is there. By May 1st you're getting soil temperatures are getting close to 60 degrees and that nitrification inhibitor, it just isn't going to last long enough that really it's making much of a difference anymore. And so it's not that it doesn't work, it's just that under that circumstance, it probably didn't make a lot of difference. And I know, Jeff, you were talking about some research related to the encapsulated product and how long it took to release.

Jeff Vetsch: Yeah, it can take some time to release, but I don't think that's a major concern. I think that the things that the growers need to think about this fall is, if these fields are our prevent plant and they have been fallow for a while, what kind of nitrogen status are they going to have out there this fall? If they don't put a cover crop on it, there could be some fair amount of N in that profile from residual or from mineralization of organic matter, and maybe an N rate adjustment or correction needs to be done.

Jeff Vetsch: And I think the other key thing that I'd really encourage growers to avoid is using those fields as early manure application fields. I know the last two falls have been really challenging to get manure on in the fall with the wet falls that we've had here in south central Minnesota. But going out there in late August or early September, that's not a good time to be putting on something like liquid swine manure, which has a very high ammonium N content, nitrifies very rapidly, and then it could be lost yet this fall before even getting to next spring.

Brad Carlson: And definitely a situation where you want to be following up with a cover crop and try and keep as much of that on site. The other part of that, as I mentioned before, was the whole issue of split application. Definitely wet conditions are situations that favor a split application. Again, it gets back to what's the risk of losing nitrogen between the time you apply it and the time the crop needs it. And by splitting it, obviously you're delaying the application and then shortening that period of time and reducing that risk. And so that is a circumstance that we would potentially see a benefit to a split application.

Brad Carlson: Benefits don't show up every year. It only happens every few years, and the conditions have to be right, and these are some of the conditions that happens. You still have to go back too, though, on an overall basis, how many years out of five does that return itself? It's maybe one out of five, one out of four, and then we also have the whole issue of the risk of being able to get back out there and doing that split application, which has been, the last two years, has been challenging.

Brad Carlson: And so, definitely something to think about, particularly if you've got certain fields that if you've got obviously lighter textured soils, it's definitely going to be a good management system. On the other hand, I don't think it's something I would necessarily just say, here in July, yep, that's what I'm doing next year. I'd still wait until spring and see how things are shaping up. If you really have ideal conditions and the long term forecast looks like it's going to be normal next

year, I don't see there's a reason to be switching from just simply putting it on all pre-plant.

Dan Kaiser: The thing I'll be interested to see too here, will be some of the data we have, and some of the studies that have been looking at fall versus spring urea too, because we've had another wet fall, another wet spring, particularly in areas where we've long maintained some flexibility for fall application. And those areas have been wetter, southwest in particular, that maybe some things and some discussions need to start being made in terms of what's the best option there.

Dan Kaiser: Because you look at it, I mean, yes it's easier to get that product out with the broadcast application, but if you're consistently, if this is of becoming the norm with some of the wet conditions, some of these intense rainfalls that something that really needs to be considered, if this is the best practice or something else needs to be looked at. And with some of the volatilization inhibitors like Agrotain out there, I mean, maybe you have to look at maybe some of these splits just as a method more to spread out the nitrogen application moving forward. May not necessarily be a benefit in terms of yield, but at least it'll be able to give us some flexibility to get away, at least, from some of these really risky applications, particularly with fall urea, which has not been looking good in a lot of areas, particularly in continuous corn systems.

Brad Carlson: And top dress with urea during the growing season is a very easy application. It doesn't require a lot as far as field conditions. Most of the vendors that are selling urea have the ability to do that now.

Jeff Vetsch: One of the areas where a split application may be advantageous is for growers that still want to put some out in the fall, preferably anhydrous ammonia as you said, Dan, but are looking at maybe holding back a portion of that and plying the rest in the spring as a side dress application. We have a couple of years of data looking at one of those kinds of situations here at Waseca and it looked promising, it still didn't yield as well as applying all at pre-plant, but it was better than applying it all, all the ammonia in the fall.

Paul McDivitt: Are there any changes growers should consider for managing P and K?

Dan Kaiser: Well, it's one of the things I've been looking at as some of the long-term data I've had in place, and particularly we look at situations where possibly it was applied before the 2019 crop, maybe before corn, and you're growing the corn in those same fields. And I started looking at some of our timing data. We had some long-term trials started back in 2009 looking at both phosphorus and potassium timing in a two year corn, soybean rotation. And the big thing that stuck out to me initially when we were looking at a year to year basis is that there really was no difference between the crops and how they're responding based on when the fertilizer was applied. Although I just looked at the final eight years in one across my studies, and a slight advantage in corn for having a little

bit of phosphorus supplied, and it might be something to consider if you've got a starter option.

Dan Kaiser: That works just about as good as anything else. If you don't want to apply at least a full load of a broadcast, I mean a starter, maybe five gallons of 10-34-0, it still seemed to be some yield advantage in situations where we'd expect response to phosphorus. Potassium timing wise, the main thing was in areas where we had salt buildup, seeing some advantage of not applying it into the soybeans. So there actually was better applying ahead of the corn. The corn really didn't seem to matter as much, but with phosphorus, soybeans has more flexibility.

Dan Kaiser: We've seen that consistently in terms of when it's applied. That's been one of the bigger questions in the past, I would say five, 10 years since I've been here, I've been looking at boosting soybean yield and whether or not we need to be fertilizing them indirectly, and I don't know what Jeff has to say on this, but still really hasn't been showing where there's been really any real advantage.

Dan Kaiser: I mean the only time I've hit a situation where we've seen a yield advantage from direct application of phosphorus ahead of beans has been a situation where I had 20-30% carbonate. So where we'd likely tie a lot of that up from the application to the previous crop. So it's interesting, looking at it rates wise, we did some changes on the potassium guidelines of spring.

Dan Kaiser: That's one thing that if you haven't seen it, be something to look at again, particularly for soybean because we're recommending slightly higher rates, particularly the medium class and high classification for what we were last time. But that's been the main thing. I don't really expect anything for phosphorus at this point. And mainly the timing thing is really what stuck out to me. What I've been telling everybody is timing doesn't matter, but it seems like it sure makes a bigger difference, probably at least front-loading a lot of that fertilizer ahead of the corn, because we're going to see bigger advantage within that overall rotation.

Jeff Vetsch: The other advantage of putting those ammoniated fertilizers like MAP and DAP on in front of corn is you can take some credit for the nitrogen in there as well. And that's always an advantage versus putting them on in front of beans. And no, we haven't traditionally seen big advantages to fertilizing the phosphorus side of the soybeans. Now in potassium, maybe that's a different story.

Jeff Vetsch: Dan, you mentioned the starter fertilizer, and I think this year with the cold, wet conditions and delayed planting, is going to be a year when growers that do have that phosphorus and a little bit of nitrogen starter are going to get a big advantage from it, just getting that crop off to a better start. The trials that we have here in the center where we have some phosphorus or starter, no starter treatments, boy, you can really see the advantage of how far ahead that that crop that got the starter is. And that's going to help get to maturity a little sooner as we get some of these late, full season hybrids that are going to

struggle getting to maturity before our first frost, and it also should help the dry down of the grain when we get to combining.

Dan Kaiser: Yeah. What I think had been a good year for starter, and that's one of the challenging things when we get these years where it's hard to get in the field and get planted. A lot of growers are asking questions, do I need it? Because they don't want to have to take the time to be loading tanks all the time. And when you start looking at it, I think it's actually probably better when you look at these type of years to have it on versus when we have more normal conditions. Even with early plantings in April, you look at the advantages of having the starter versus no starter, and it doesn't seem to be as big. So it's one of the things I think to consider, and as I said, that is an option next year. If you have phosphorus supplied and fields all ready and you're going to corn, maybe putting a little starter on and not having to worry about broadcasting anything. Save a little money at least next spring for the crop.

Jeff Vetsch: And I think that Bundy's researching Wisconsin. It's getting a little dated, but he showed that the advantage that he saw in starter was with these later plantings and getting that advantage of getting that crop going a little faster on these later plant situations.

Paul McDivitt: What about micronutrients?

Dan Kaiser: Well, the other thing, when we talked a little bit about the mycorrhizal issue, we know that it can affect phosphorus. It also can affect zinc. So if you do see situations with fallow syndrome, or you suspect it to mean starter, some sort of in-furrow, I mean the issue with it, usually it's going to be rate. That's another thing I don't know is, normally it still can take a fairly high rate of phosphorus where it's hard to do with a liquid in-furrow, particularly if you're dealing with a higher cost, lower salt product. You are, though, looking at chelated zincs, probably not a bad thing to consider in those circumstances as well, was that might come into play. I wouldn't suspect, though, anything else really being that big of a deal. We've been looking at research with boron, just aside from issues we had with whether boron overall across a lot of the data we have in the state really hasn't been shown to give us any of the yield advantage for corn or actually sugar beet as well.

Dan Kaiser: We looked at that and some heavier soils as well. So there isn't anything that really out of the ordinary I'd worry about. I mean the big thing that's kind of stuck out this year in the last few years has been sulfur, and that's not a micronutrient. I've been seeing, particularly here, we're recording this at Waseca here. The sites here are corn on corn. We've seen some pretty substantial yellowing in the last year in the 2018 crop, and then this year it's really striking, particularly if you look at the plots with and without sulfate. I have some elemental sulfur treatments, and those aren't looking so hot right now either.

Dan Kaiser: So with these cooler conditions, more residue and not a lot of breakdown, you see a lot more potential for sulfur as well to be an issue. So if you're not applying, I think it's something to consider, particularly in high residue situations. Prevent plant situations, probably not going to be as big of a problem, just because there wasn't really much out there. Not that much residue, but it's something to think about.

Jeff Vetsch: Yeah, I think there's still a lot of growers that use LML sulfur for corn and apply it in the fall, and I think getting that oxidation and getting that available is challenging, especially in a year like this year. And I think last year was the same thing. Growers really need to recognize that they need some sulfate out there. They can't rely completely on elemental if they're looking at continuous corn in particular.

Dan Kaiser: Yeah. And one of the AFREC projects, the one that we have here in Waseca, we're looking at that long term. So it's been continuous corn, and I'm going to look at yearly applications of elemental, because I really want to see is, do we get enough oxidation late and see some sulfate carried over from that late oxidation for the next year. And it was interesting last year, 2018 we had a fall versus spring trial out here. We had some elemental, and the fall versus spring here at Waseca didn't make any difference.

Dan Kaiser: At Rosemont, or actually, it was a little closer to Red Wing, we had a site. That one, it definitely made a big difference. A spring application was more advantageous without the silt loam soil, and I would suspect more leaching from that. But here, I mean the timing wasn't that big of a, there wasn't really any effect of the sulfate fall versus spring.

Dan Kaiser: It was the same yield. We did get a little boost from the elemental sulfur, but it still yielded less than the sulfate sources. So it's one of the things I think long-term maybe you see a lot of elemental being applied out there. And I think the saving grace for us right now with that product is the fact that a lot of these growers are applying phosphate sources which still have some sulfur impurities, and many of these fields really only need about five pounds. And we usually get that with some of the impurities in the phosphate sources. So I think that's why probably some of these growers are getting away with elemental as consistent as they are. Because of that, those impurities are coming into play and supplying most of what they need at least for the corn going into that particular year.

Jeff Vetsch: Well, and we have a lot of growers in this area now that are growing corn on corn that have went to a split banded starter where they're putting some nitrogen and maybe a little bit of ammonium thiosulfate on a few inches off the row and a dribble band on the surface. And that's a great opportunity. If you want to put on some elemental to cover the majority of your sulfur needs, and put in a couple of gallons or three gallons of ATS along with that nitrogen in that dribble band in a corn on corn situation and then you're going to be covered on both sides.

Dan Kaiser: I think a lot of times the two, three gallons of ATS is enough. You look at the data we've generated with it, that's a good option. I actually liked that particular set up, particularly if the growers have, maybe they were once doing in-furrow, but they decided to stop because they weren't seeing a benefit and they still have the pumps. That surface dribble band is a nice way. I put some nitrogen on, put some sulfur down, particularly if you're looking at any sort of split application and they give you something early on that and gives you a little more flexibility in terms of when you have to come back in and apply.

Dan Kaiser: But with thiosulfate, that is somewhat of an elemental source as well, but it gives you immediately available sulfur as well. I think that that liquid band, and I've seen some pretty impressive responses with that, so I think it's something to consider if you're looking at trying to deliver sulfur, particularly if you don't want to worry about a fall application.

Jeff Vetsch: Well, you know if growers, they do really think that thinking about the crop rotation there as being a big factor though. It really has the greatest impact in corn on corn and corn after soybeans. I think there's a lot of different things you can do and you'll be fine. It doesn't have to be done in corn after soybean.

Dan Kaiser: No, but we know that some of these soils down around this area, corn, soybean, there is a need, but those are the ones who are usually finding five pounds or less. You end up needing a lot of sulfur really to get it through. It's just getting it through that early spring where we have more reduced sulfate in the profile. It's not available, so the crop is mainly what we're trying to do with many of these situations.

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 this podcast. For the latest information on nutrient management, you can follow us on Facebook and Twitter at UMN Nutrient MGMT, where you can also send us your questions for future podcast episodes. Thanks for listening.

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