July 2020

Swine Building Maintenance Webinar Series to be Offered Online

ISU Extension and Outreach is joining industry partners to offer a five-part webinar series on the maintenance issues faced by facility managers and maintenance crews. Online sessions will discuss concrete pit maintenance and construction, truss management, roof and moisture management and other repair and maintenance issues that can help protect the building and extend its life. Participants also will learn how to allow clean air into the attic space and minimize pit-ventilated gases from entering the attic during periods of minimum ventilation during winter months, helping to reduce roof corrosion. Ways to maintain concrete slats including their repair, to help enhance their usable life, will also be discussed. One-hour long sessions will be held from 1 PM to 2 PM central daylight time on August 19, 21, 24, 26, and 28. Pre-registration is required and is $20 per participant for all five sessions. Registered participants will be sent a zoom web link to join online prior to start of sessions. Additional details about the sessions, sponsors, registration, etc. are available through the Swine Building Maintenance Webinar Series Website.

RUSLE2 and Iowa Phosphorus Index Workshop Online Sessions

Iowa State University Extension and Outreach has scheduled a workshop to train livestock producers and service providers on how to use the Revised Universal Soil Loss Equation 2 (RUSLE2) and the Iowa Phosphorus Index in nutrient management and manure management plans. This workshop will be held online from August 10 through August 14. Each day, one session will be held from 2:30-4 p.m. central daylight time using Zoom. A web link will be sent daily to the participants to join the zoom session online. Participants will be divided into breakout rooms within Zoom to work in small groups on real field examples. These examples will also be used to determine risk calculations of the Iowa Phosphorus Index and how to incorporate these numbers into manure and nutrient management planning requirements. Manure management planning, soil sampling requirements, common errors and the IDNR's review process also will be discussed. Registration for the workshop is $150 if registered by August 5; and is limited to 15 participants. To obtain additional details and to register for the workshop, please visit the RUSLE2 and Iowa Phosphorus Index Introductory Level Workshop's Website.

Striped Corn Fields and Manure

Earlier this spring, I drove through Iowa and saw some stripes or streaking in fields of corn. The tell-tale signs of darker strips of green mingled with yellow right near it. While there are potentially numerous causes, they can be in fields that get synthetic fertilizers as well as manure.

So, let's talk about what we are seeing and looking for, and perhaps why this year we saw it a bit more vividly.

To me, this always most pronounced early in the growing season – especially in years with a cooler spring.

When it comes to nitrogen supply, typically we have multiple sources, the fertilizer we add to support crop growth and mineralization from the soil. Early in the growing season, especially when soils stay cool, plants are more dependent on the added nitrogen (additionally, the less formed root system means they are not collecting from larger areas of soil). As temperatures get warmer and soil mineralization speeds up, often times things will start to look a bit more even.

So, let's start with liquid manure. Here we are talking about two things; knife-to-knife variability and the N application angle relative to the planting angle. The first is a machinery question – how uniform is the flow with different distributors and sizes of the tool-bar? The second means the corn will be planted different distances from the nitrogen source so it will be different sizes when the roots finally make it to the nitrogen. So, what are we looking for to tell if this is an issue in our field – is the striping that occurs at the spacing of the knives and in the direction of travel of the manure application?

I've often approached this topic for liquid manure with a discussion on how much variability we are seeing from knife-to-knife. Why should we worry about manure application uniformity? Nitrogen for crop growth can come from multiple sources, the soil organic matter can mineralize and in doing so release mineral nitrogen for the plant. The remaining nitrogen needed to support crop growth comes from applied fertilizer. Years of research has gone into characterizing how crops would respond. If you take a look at the Nitrogen Rate Calculator it will give you an idea of how a corn crop (in this case corn following soybeans) responds to the addition of nitrogen. Table 1 shows how the addition of nitrogen causes corn to respond. What the figure demonstrates is we want to apply somewhere around 150 lb N/acre, if we are less than this the yield goes down, if we apply more than this, we see minimal yield improvement.

So what does this all have to do with manure application uniformity? When we are trying to hit 150 lb N/acre does that mean we just need to average that for the field? Probably not, it's about getting a condition where it's uniform over the whole field. Yes, there might be some soil variations and every field has a bit different response to nitrogen, and weather conditions matter so some year's crop response to nitrogen is much more drastic than others, but for the sake of argument, let's work with this curve to see what it means. For fun, let's think about the math behind this problem. Assume we have corn planted on 30-inch spacing, our manure toolbar also has 30-inch spacing, and that corn roots only get their nitrogen from the manure application band that was placed next to that cornrow. Then let's figure we applied 150 lb N/acre from liquid swine manure that tested 50 lb available N/1000 gallons, so we were applying 3,000 gallons an acre.

Now, think about two pieces of equipment; one has a knife-to-knife coefficient of variation of 35% at this application rate, and the other has a coefficient of variation of 10%. In both cases, let's figure an 8-knife setup. To give you an idea of what this looks like in terms of nitrogen application rates achieved by the different knives and the impact different levels of uniformity have on crop yield, let's run through an example. Both of the tools in this example hit the right application rate on average, but how they do it, in terms of evenness across the toolbar is very different. What I want you to start thinking about is what would this mean for your crop yield from row-to-row and nitrogen leaching.

Let's do a nitrogen example. Using the nitrogen response curve you can make an estimate of the corn

Dan Andersen, dsa@iastate.edu, (515) 294-4210, @DrManure
Rachel Kennedy, rakenned@iastate.edu, (515) 294-6685
Melissa McEnany, mmcenany@iastate.edu, (515) 294-9075
July 2020

yield would be achieved from each of the knives (and if you assume a maximum yield of around 200 bushels an acre) can figure out what the field level yields would be. So, if you work through this math, you can find a few interesting results (table 1). Even though we were putting on the same amount of nitrogen, because of variation from knife-to-knife, we get different average yields per acre. In the case of corn following soybean, yields increased by 2 extra bushels per acre yield from the improved distribution, and in the case of continuous corn, about 4 extra bushels per acre. But there are other things to notice; the coefficient of variation in corn yield is always much lower than in the nitrogen application rate. The soil supplies some of the nitrogen and this dampens out the response making everything a bit more uniform, but one thing to keep in mind is that early in the growing season the response might be more visually drastic than what final yields end up showing. Overall, I think this asks interesting questions; how good is uniform enough, how does application uniformity uncertainty compare with other uncertainties in crop production, and how does this information help us make better manure decisions?

Table 1. Nitrogen and manure application rates for two pieces of application equipment that achieve different levels of manure application uniformity.

	ToolBar1	ToolBar2	ToolBar1	ToolBar2
Knife #	N Application (lb N/acre)	N Application (lb N/acre)	Corn Yield* (bu/acre)	Corn Yield* (bu/acre)
1	100	150	187	194
2	135	160	193	195
3	165	170	196	196
4	210	160	198	195
5	220	150	198	194
6	180	140	197	193
7	120	120	191	191
8	70	150	178	194
Average	150	150	192	194
St. Dev.	53	15	7	2
COV	35	10	4	1

*Based on maximum yield of 200 bushels an acre.

What about on the solid manure side? Again, we can see the same thing if solid manure isn't uniformly spread, but it can bet a bit more complicated than that. What type of manure are we talking about and was it the only fertilizer source? If the manure had a high C:N ratio (such as straw rich bedded pack manure), the heavier application spots may look deficient, not those that didn't get as much manure, but because as this material breaks down, we may be experience short term nitrogen tie-up. Learning to watch and diagnose these spots is important for learning what it has to teach you.

Events

RUSLE2 and Iowa Phosphorus Index Workshop Online Sessions
August 10 – 14, 2020, 2:30 – 4:00 pm

Communicating Science Using the Science of Communication Webinar
August 14, 2020, 1:30 pm

Swine Building Maintenance Webinar Series
August 19, 21, 24, 26, and 28, 1:00 pm – 2:00 pm

Dan Andersen, dsa@iastate.edu, (515) 294-4210, @DrManure
Rachel Kennedy, rakenned@iastate.edu, (515) 294-6685
Melissa McEnany, mmcenany@iastate.edu, (515) 294-9075
July 2020