April 2018

The Real Scoop on Manure

In this month’s blog, The Manure Scoop takes a look at the impact of water quality in Iowa as animal agriculture expands. As always, I look forward to hearing your thoughts on this topic.

Figure 1. A swine farm adds value to Iowa agriculture, but how does it impact water quality?

Reviewing Nutrient Concentrations at the Iowa State University Dairy Farm

Figure 2. Find out how the solid separator at the ISU dairy affects manure nutrient concentrations.

In 2008, ISU built a new dairy farm for teaching, research, and extension programs. The farm was designed for a 400 milk cows. The cows are in a free stall barn, bedded with either wood shavings or separated manure solids, and the alley manure is scraped daily into a reception pit and run through a solid separator (FAN Press Screw Separator). This year in the Ag Engineering/Agronomy, Central Iowa, and BioCentury Research Farms 2017 Annual Progress Reports discussed what manure concentrations had been over the past nine years.

The liquid manure is stored in a 3.5 million gallon-topped-top glass-lined slurry storage tank. The liquid manure is agitated for 24 hours and then land applied. Liquid manure in the slurry tank is sampled at each application. Based on the 9 years of samples collected, a summary of the typical nutrient concentrations was provided.

For points of comparison, according to Midwest Plan Service, there are approximately 31, 15, and 19 pounds of N, P₂O₅, and K₂O per 1,000 gallons in slurry dairy manure. The ISU dairy manure has averaged 25 ± 3, 10 ± 2, and 19 ± 2 respectively for
N, P$_2$O$_5$, and K$_2$O over this time period. In terms of concentrations, our dairy averaged slightly lower in N and P$_2$O$_5$ concentrations than would be expected, but was at the typical average for K$_2$O concentrations. While this could be in part due to climatic conditions at this dairy, given that K$_2$O concentrations are at average this appears unlikely and is probably due to the separation of solids with the FANS unit.

Given the typical performance of screw press separators on dairy manure, we’d expect little to no change in the K$_2$O concentration of the liquid fraction, but generally about 13% of the nitrogen and 21% of the phosphorus would end up in the solid fraction (would is typically about 10% of the total volume). This would result in an approximately 4% and 12% decrease in the N and P$_2$O$_5$ concentrations in the liquid relative to that of the original slurry manure (or approximately 1 pound of N and 2 pounds of P$_2$O$_5$), accounting for some of the of the difference between our concentrations and the typical ones.

In terms of seasonality, neither phosphorus or potassium concentrations differed in the spring and fall. Nitrogen concentrations averaged 3 pounds higher in the spring, presumably due to the colder temperatures during the storage period that reduced ammonification of organic nitrogen and resulted in reduced volatilization. Additionally, the results indicated the nutrient concentrations were proportional to rainfall, with higher rainfalls resulting in lower nutrient contents. Specifically, nitrogen concentration was reduced by about 0.2 lb N per 1,000 gallons for every additional inch of rain during the storage period.

Overall, the data collected on the dairy farm provides some insight into how consistent the nutrient content is and how typical nutrient concentrations are altered by pretreatment with a screw press separator.
Learning about soil health isn’t just for youth; if you’d like to learn more, The Soil Health Nexus is a great resource and features monthly blog posts.

Events

April 20, 2018, 1:30 pm
Equipment and facilities for managing manure on small farms webinar

August 15-16 2018
Brookings, South Dakota
Manure Expo