



October 2019

Best Management Practices for Fall Manure Application

Here is a list of Best Management Practices (BMPs) that can be implemented by all livestock farmers and commercial manure applicators to maximize use of manure nutrients for crop production and reduce potential impacts of water quality this fall.

1. Soil and water conditions

Know where tile lines and tile inlets are located. If you think preferential flow to a tile line is possible, consider plugging the tile to prevent movement of manure to water sources or installing a flow control structure to manage drainage. If runoff conditions are present, take time to cover or block tile inlets.

If early spring rains caused erosion and formed gullies on your farm, take some time to map out these conditions so caution can be used during land application to prevent breaking axles on manure tank wagons or even possibly tipping over a tank wagon.



Figure 1: Block tile inlets if runoff conditions are present.

2. Keep an eye on the forecast for heavy rainfall events

While not 100 percent predictable, the amount and intensity of rainfall greatly affects nutrient retention. If you surface-apply manure, you could lose nutrients from runoff of nutrients on the soil surface. If you inject or incorporate manure, an intense rainfall event could increase soil erosion and possible off-site movement of nutrients due to the soil disturbance of injection or incorporation. In either case, a low intensity rainfall could benefit movement of nutrients into the soil, but a high intensity rainfall could cause loss of nutrients from runoff and erosion. Again, attempt to apply manure on fields away from water sources and keep an eye on the weather forecast.

3. Calibrate, inspect, and maintain manure application equipment

As with all farm equipment, calibration of manure application is necessary. Calibrating manure application equipment takes a little time, but helps to meet the correct application rate and make manure nutrients more effective and efficient.

Calibrating Liquid Tank Manure Applicators Calibration and Uniformity of Solid Manure Spreaders

Also take time to inspect and do maintenance on equipment. This will help protect employees and reduce the chances of equipment malfunction that can lead to over or under-application, cause serious damage to equipment or cause a manure spill.

4. Separation distances for land application

All animal feeding operations, regardless of size, are subject to manure application separation distances from designated areas (water sources). Get a copy of an aerial photograph of all fields to which manure is applied. Map out neighbors' houses, churches, businesses, schools, cemeteries and other public use areas, as well as all designated areas such as sinkholes, wells, including abandoned wells, cisterns, designated wetlands, water sources, high quality water resources, ag drainage wells and tile inlets to ag drainage wells. Identify all other sources of concern for manure application. Sketch out separation distances. Train your employees to read the maps and stay away from areas where manure is not allowed to be applied. Read [DNR Fact Sheet 113](#) on separation distances for manure application.

5. Irrigation of manure sources

Irrigated manure sources often have low nutrient concentration, which allows for high application rates. These rates can sometime be in the tens of thousands of gallons per acre. When irrigating manure, be sure to understand soil infiltration rates to prevent over-application of liquid that could lead to surface runoff of manure sources. These sources of manure may need to be applied over a course of multiple application events. Check to make sure all irrigation equipment is properly calibrated and in good working order. Continuously monitor the equipment to make sure it is working properly and no runoff is occurring.

6. Savvy stockpiling and dry manure management

Be sure to follow all dry manure stockpiling rules. Information is available on the DNR's Animal Feeding Operations Web page. The goal is to make

sure the stockpile is located such that runoff or leaching from the stockpile does not affect water sources.

Dry-Bedded Manure Stockpiling Regulations for Cattle and Swine Confinements Confinement Dry Manure Stockpiling Regulations Open Feedlot Manure Stockpiling Regulations

Open feedlot producers should take advantage of dry weather conditions to scrape manure from feedlots so if we do receive rain there are less nutrients on the feedlot to move through the settling basin. This helps reduce potential impact on water sources and provides a nutrient source that can be used for crop production next year. Producers should also consider removing manure from settling basins. Dry conditions offer a great opportunity for thorough settling basin cleaning and maintenance.

7. Develop an emergency spill response plan

Hundreds of millions of gallons are safely applied each year in Iowa, yet manure spills can occur, so plan accordingly. Train employees and family members in manure spill response. Ask commercial manure applicators if they have a plan of action in the event of a spill. If they don't have a plan, require one. Keep important phone numbers and contact information for excavators, neighbors with pumps and tractors, and local officials and emergency response units up-to-date and posted where everyone knows where to find them. Remember to contact DNR if a manure spill or release does happen. You must report any spills or releases within six hours. Call the 24-hour spill hotline at 515-725-8694.

Emergency Action Plans

8. Evaluate soil temperatures

Much like avoiding fall anhydrous ammonia application until soil temperatures are 50 degrees and cooling, the same applies to liquid manure with high amounts of ammonium-nitrogen such as liquid swine manure. Producers and commercial applicators should consider delaying manure application until soil temperatures cool down to slow the rate of nitrogen conversion and the potential loss of nitrogen if conditions turn wet yet this fall or next spring.

9. Plan for next year

Remember to account for the nitrogen and phosphorus needs of your crop next spring. If liquid manure is applied early this fall and loss conditions occur, supplemental nutrients may need to be applied next year. Keep in mind what your manure or nutrient management plan allows for application rates. In most cases, it pays to plan ahead when using manure as a nutrient source even a year in advance.

Understand your manure storage needs through the next 12- 14 months. If you haul manure in late summer or early fall, will you have enough storage to get you through next year if the spring is wet or fall harvest is delayed the following year? Make sure you have adequate storage or land available for manure application after next year's growing season.

10. Be safe

Fall is a busy time of year for farmers and commercial manure applicators. Get plenty of rest, take breaks and slow down. Observe all laws of the road and watch out for the "other driver." They may not realize you are moving at a much slower rate of speed or how long your tractor and tank wagon are when they attempt to pass you on the road. Check "slow moving vehicle signs" and replace as needed. Check lights to make sure they are working and are visible. Install additional lights as needed to improve your visibility and to help people see you. Make sure employees and family members meet manure applicator certification requirements and are well trained to handle various situations. Take time to train new employees and refresh the memory of experienced employees.

The Manure Scoop

In this month's [Manure Scoop](#), I ramble a bit about what a manure plan is, why we have them, and nutrient management. Please read and let me know your talking points when people ask you about what a manure management plan is supposed to do.



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Figure 2: Students develop manure management plans in Beef Feedlot Systems Management class.

The science behind 50-degree soil and nitrogen application

Every year we hear a chorus of reminders to wait until soil temperatures at the 4-inch depth are 50°F and trending cooler before applying anhydrous ammonia, and those of us in the manure world tend to echo these comments. That is if you are applying an ammonia rich manure, liquid/slurry hog manure wait until soils start to cool before applying. So, what is the science behind this recommendation, especially for manures?

This recommendation is based on the potential for nitrogen loss. Remember, there are a few forms of nitrogen that can be applied or are found in soils these include ammonia/ammonium, nitrate, and organic nitrogen. Of these forms, all forms can be lost, but ammonia and nitrate tend to be the most mobile.

Ammonia is lost as a gas, so if we are using an ammonia/ammonium fertilizer (like swine manure) it's important to get the fertilizer into the soil quickly where the ammonia will react with the soil particles and be held, rather than letting it sit on the surface where some of it can be lost to the air. This is why injection or immediate incorporation can be a great technique for getting the most from your manure, it makes sure that we aren't immediately losing some portion of the nitrogen we are applying.

Nitrate on the other hand is lost with water, especially water moving through the soil to groundwater or tile drains. Nitrate is super soluble, so if water is moving and we have nitrate in our soil, it is probably moving with the water. We tend to have larger rains in the spring coupled with wetter soils from snow melt, this means that if the nitrogen we applied is in the nitrate form there is a high opportunity for it to be lost in the spring.

When it comes to manures, it's pretty much nitrate free when we apply it, but microbes in the soil will process it and turn it to nitrate. The activity level of these microbes is controlled by how much ammonia is present, the amount of water and oxygen in the soil, and the soil temperature. Although all these variables are important, for now I'm going to focus just on temperature. A good rule of thumb is that microbial activity will double for every 18°F increase in temperature (so if our soil is at 68°F those microbes will be turning the ammonia in the manure into nitrate at about 2x the rate they would if our soil was at 50°F). Often times this means that not only will the microbes have more time to cause the conversion to nitrate, but they might be doing it much faster than if fertilizer application had waited.

Does nitrogen becoming nitrate mean we are going to lose it? No, it takes rainfall or snowmelt in the spring that will cause a leaching event, but it does increase the risk of loss. Certainly there is a balance between making sure we get our manure applied before the soil freezes and applying too early. As a reminder, Iowa State University

Extension and Outreach maintains a statewide real-time soil temperature data map on their website that ag retailers and farmers can use to determine when fall applications are appropriate. The website can be found at

<https://mesonet.agron.iastate.edu/agclimate/soilt.php>.

Events

November 15, 2019, 1:30 pm

[Managing Manure to Mitigate Antibiotic Resistance Webinar](#)

December 4-5, 2019

[Integrated Crop Management Conference](#)
Ames, Iowa

January 2020, 14 locations statewide

[Crop Advantage Series](#)