Granules

Tips, Updates, and Insights from the Encirca® Services Agronomy Science Team

Updates to Manure for Nitrogen Management by Encirca® services

Summary

- For farmers applying manure to their fields, getting the proper nitrogen credit for that manure is crucial for generating accurate recommendations. Hence we've made some updates to how Manure applications are modeled.
- Updated settings in the Encirca services nitrogen model's manure settings provided approximately 85-90% of the target mineralized organic N from manure sources by VT/R1, and surpassed 100% part way through Grain Fill.

Introduction

Manure is a unique source of nitrogen in that it contains two forms: inorganic (usually in the form of ammonium or NH4+) and organic. The inorganic N is very plant available and behaves similarly to commercial fertilizer products. The organic N, however, must break down over time (dependant on moisture and temperature) through mineralization to become plant-available.

Here's an example manure analysis for a liquid swine slurry:

Analysis	Results as Received	Total Pounds per 1000 Gal	First Year Availability Pounds per 1000 Gal
Nitrogen, Total (TKN)	0.387%	32.2	27.8
Nitrogen, Ammonium (NH4-N)	0.305%	25.4	25.4
Nitrogen, Organic (N)	0.082%	6.8	2.4

As you can see, the laboratory estimated that 100% of the inorganic (NH4-N) Nitrogen is available the first year, but only 35% of the organic Nitrogen (2.4 / 6.8) will become available. More may become available in subsequent years but at a diminishing percentage each year. The availability each year is based on university research and is oftentimes species- and management-specific. (Refer to MWPS-18 "Livestock Waste Facilities Handbook" for more information.)

For this example, if the grower intended to apply 5000 gallons per acre of this manure, the calculation of applied inorganic and organic nitrogen would be:

- Inorganic: 5000 gallons / 1000 gallons * 32.2 lbs N/1000 gallons = **161 lbs N per acre**
- Organic: 5000 gallons / 1000 gallons * 2.4 lbs N/1000 gallons = **12 lbs N per acre**

It is also worth noting that actual "as-applied" amounts of nitrogen may be decreased due to handling and application losses.

Details

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Last Updated: February 1 2018

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Adjustments were made to the Manure settings for the Encirca services nitrogen model and were tested prior to release. For this, 12 sites were selected across the Midwest. All sites were given separate simulated manure applications (Dairy, Cattle, Swine, and Broiler) in the spring, with three of the sites also receiving applications in the fall, for a total of 15 site-years. In addition, baseline simulations in which no manure was applied were also run for each site-year in order to measure the mineralized N from the site's soil organic matter.

The estimated organic N Available First Year was calculated for each manure source; this is the amount of mineralized nitrogen one would expect to see become available during the growing season:

Name	Rate	Organic N	Organic % Avail First Year	Organic N Avail First Year
Dairy Slurry	5,000 gal/acre	13.3 lbs/1000 gal	35%	23.4 lbs/ac
Cattle Lot	10 tons/acre	21.6 lbs/ton	25%	54.0 lbs/ac
Swine Slurry	5,000 gal/acre	16.7 lbs/1000 gal	35%	29.2 lbs/ac
Broiler	3 tons/acre	61.0 lbs/ton	55%	100.7 lbs/ac

Mineralized nitrogen from organic matter only was determined for each site-year as a baseline. Then, the mineralized nitrogen from both organic matter and each manure application was determined. Finally, the difference of net mineralized N between each manure application and the baseline was determined for each site-year to determine net mineralized N from manure, then averaged by species.

VT/R1 Growth Stage, lbs/ac of net mineralized N, average across all site-years

Source	Dairy	Cattle	Swine	Broiler
Simulated Lbs N/ac	20.4	48.5	25.5	90.4
Target Lbs N/ac	**23.4**	**54.0**	**29.2**	**100.7**

Black Layer Growth Stage, lbs/ac of net mineralized N, average across all site-years

Source	Dairy	Cattle	Swine	Broiler
Simulated Lbs N/ac	25.0	59.2	31.2	110.4
Target Lbs N/ac	**23.4**	**54.0**	**29.2**	**100.7**

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Last Updated: February 1 2018