Twelve Years of Dairy Manure Nutrient Analysis in Vermont: Agronomic and Environmental Implications

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Uses of Manure Analysis

- Individual reports for farm-specific nutrient management planning
- Multi-year (3-5) averages to establish “typical” or book values for manure nutrient content (Jokela et al., 2004)
- Long-term summaries
  - Long-term averages (12 years in this case)
  - Trends over time
  - Relationships among manure nutrients and properties (data not shown here)

Manure Nutrient Analysis Program

Univ. of Vermont (UVM) Agricultural and Environmental Testing Laboratory

- Started manure analysis program in 1992
- 1,800 dairy manure samples, 1992-2003
- Manure analysis methods
  - Analyze for TN, NH₄-N, P, K, Mg, Ca, Mn, Fe, Zn, Cu, and B
  - Use standard methods (Peters, 2003)
- Participate in Manure Analysis Proficiency Program

Manure Types

- Liquid: Pourable, DM < 20%
- Semi-solid: Pourable, but DM > 20%
- Solid: Not pourable, DM > 20%

Manure Samples Numbers by Year and Type 1992-2003

Results

Average Nutrient Content of Dairy Manure

UVM Laboratory, 1992-2003

MNV and WI Labs and MWPS Reference

Distribution of Cu Content in Liquid and Solid Manure

Variable of Nutrient Content

Wet vs Dry Matter Basis, Liquid manure

Manure Type

P, DM Basis

Variability of Nutrient Content

Wet Basis

Manure Type

P, DM Basis

Liquid

Semi-Solid

Solid

References


Summary

- 12-year averages in range of reference values
  - Variability
    - Big range, high variability, even on DM basis
    - Emphasizes importance of analysis (vs. reliance on book values)
  - Trends over Time
    - Most nutrients: No consistent trend
    - Decrease in phosphorus content (about 30%)
    - Result of reduced P in dairy rations
    - Environmental and agronomic implications
    - Less P loading where nutrient runoff a concern
    - Lower fertilizer value for P deficient soils
    - Dramatic increase in copper content (>3x), especially post-1998
    - Presumably due to increase in use of CuSO₄ foot baths
    - Crop toxicity concerns?
    - Medians showed same trends as means

No consistent trends in content of P, N, and most other macronutrients. However, 30% decrease in P content of all manure types and over 3-fold increase in Cu content of liquid manure, with some extreme values of several thousand mg/kg Cu.