

For More Information

For information or assistance with your **management options**, contact your local Natural Resources Conservation Service (NRCS) or conservation district office.

Natural Resources Conservation Service
10 East Babcock Street
Federal Building Room 443
Bozeman, MT 59715
(406) 587-6813
<http://www.mt.nrcs.usda.gov>

Montana Assoc. of Conservation Districts
501 N. Sanders
Helena, MT 59601
(406) 443-5711
<http://www.macdnet.org>

For information or assistance with **regulatory requirements** of manure management, contact the Montana Department of Environmental Quality.

Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
(406) 444-2544
<http://deq.mt.gov/index.asp>

Manure as a Resource Series

Three additional brochures are in this series. To receive a copy of any of the following brochures, visit your local NRCS office or the NRCS website.

- Sampling Manure for Nutrient Management
- Calibrating Manure Spreader Application Rates
- Sampling Soils for Nutrient Management.



United States Department of Agriculture
Natural Resources Conservation Service

Using Manure Analysis Results

Manure as a Resource Series



Helping People Help the Land

Using Manure Analysis Results

Livestock and poultry manure is a valuable resource. When applied to cropland and forage land, manure can:

- Provide nutrients for production,
- Improve soil structure and water holding capacity, and
- Reduce the amount of commercial fertilizer needed to reach yield goals.

To fully realize the fertilizer value of manure and protect the environment, a nutrient management plan is recommended for each field that will receive manure. The plan is a plant food budget for the field. Balancing the nutrients added with plant uptake by the crop or forage prevents nutrient buildup and prevents surface and ground water pollution.

A nutrient management plan includes:

- Realistic yield goals,
- Plant nutrient recommendations,
- Current soil test results,
- An estimate, based on lab analysis, of the nutrients that will be supplied by manure,
- Credits for nutrients supplied from other sources such as legumes, irrigation water, organic matter,
- Amount of commercial fertilizer required to supplement nutrients supplied by manure application, and/or
- Identification of sensitive areas where manure should not be applied.

An accurate estimate of the nutrients available from manure is influenced by:

- How the manure sample was collected, prepared, and shipped; and
- How the manure will be applied.

Poorly handled samples do not provide accurate estimates of the nutrients contained in the manure. Improperly calibrated equipment will result in over or under applying manure. Either mistake can be costly. Here's why:

- Expected nutrients from manure may be insufficient to reach yield goals.
- More or less commercial fertilizer than needed could be applied.
- Nutrient build up in the soil may affect future manure applications to the field.
- Excess nutrients in the soil may cause water resource degradation.

The local Natural Resources Conservation Service (NRCS) office has procedures and software for preparing a nutrient management plan. Take advantage of this knowledge by visiting your local USDA Service Center or <http://www.mt.nrcs.usda.gov/technical/ecs/agronomy/nutrient/index.html>.

For more information about sampling manure and calibrating application equipment, see the rest of the Manure as a Resource Series. In particular, "Sampling Manure for Nutrient Management" and "Calibrating Manure Spreader Application Rates" may be helpful. Both brochures are available on the NRCS website at <http://www.mt.nrcs.usda.gov/>.

Nutrient Availability

Nitrogen, phosphorus, and potassium in manure are present in two forms:

- Organic compounds
- Inorganic compounds

Nutrients become available for plant growth when organic compounds decay. During the decay process, bacteria and fungi convert the organic compounds to inorganic compounds by a process called mineralization. The rate of mineralization is affected by temperature, moisture, soil chemistry, and time. Therefore, not all of the nutrients in the organic compounds are available for use by the plant the year manure is applied.

Mineralization occurs most rapidly in warm, moist, neutral to slightly alkaline soils.

Using the Analysis Report

Most laboratory reports provide information about the moisture, dry matter, and nutrient content of the manure sample submitted. The format of the report may vary with the type of manure submitted, the analysis requested, and the laboratory completing the analysis. Results are usually reported in two ways.

- As a percent by weight per ton or 1,000 gallons or
- On both an “As Received” and “Dry Matter” basis.

An example of a report format used by some laboratories is shown to the right.

Manure is usually applied in the form it was

sampled. Therefore, the “As Received” results must be used to plan a manure application (Lb/1,000 gal or Lb/ton). If the lab analysis reports nutrients in part per million (ppm) or milligrams per kilogram (mg/kg), convert the analysis to pounds using one of these equations.

Note that the conversion factor for lab results reported in ppm or mg/kg is the same. Therefore, these types of results can be entered interchangeably in the “Results” position in the following equations.

Liquid Manure

$$\text{Lb/1,000 gal} = \text{Results} \times 0.00834$$

Solid Manure

$$\text{Lb/ton} = \text{Results} \times 0.002$$

If your lab analysis reports nutrient concentration as a percent by weight (%), convert the analysis to pounds using one of the following equations.

Liquid Manure

$$\text{Lb/1,000 gal} = \% \times 83.4$$

Solid Manure

$$\text{Lb/ton} = \% \times 20$$

(Note: This assumes that the density of liquid manure is similar to that of water, which is about 8.3 pounds per gallon.)

Fertilizer recommendations are based on the:

- Inorganic nitrogen (N) and
- Phosphorus (P₂O₅) and potassium (K₂O) oxide equivalents.

If the analysis report doesn’t provide phosphorus and potassium equivalents, the values can be

determined using the following formulas.

Phosphorus

$$\text{Lb P}_2\text{O}_5 = \text{Lb Phosphorus} \times 2.29$$

Potassium

$$\text{Lb K}_2\text{O} = \text{Lb Potassium} \times 1.2$$

Analysis Report

Results on “As Sampled” Basis

Analysis Report for:

Tom Doe 1710 Wildflower Way Rural, MT 59xxx				Reported: 7/20/xx Received: 7/31/xx	
Lab ID	Sample ID	County	Material	Type	Storage System
M001		Gallatin	Manure	Poultry (broilers)	Bedded pack/litter

Analyte	Lb/ton	Lb/1,000 gal
Solids: 71.7%		
Total Nitrogen (N)	60.9	253.9
Ammonium N (NH4-N)	6.64	27.68
Calculated Organic N	54.3	226.2
Total Phosphorus (P2O5)	68.8	287.1
Total Potash (K2O)	54.3	226.4

The Nutrient Value of Manure

The actual nutrient value of manure is estimated on the manure analysis. However, the actual amounts of nutrients available to crop or forage plants is dependent on climatic conditions, soil characteristics, and manure application method.

The method used to apply manure and the length of time from application to incorporation plays a significant role in the amount of nutrients available. Producers can expect a 5-10% nitrogen loss when injecting manure with sweeps or knives. If manure is broadcast on the soil surface and then incorporated, losses will range from 30% if incorporated within 12 hours up to as much as 50% if incorporated after 4 days. If liquid manure is applied through irrigation sprinklers, approximately 25% can be lost through volatilization (loss to atmosphere).

Delays in incorporating manure increases the potential for phosphorus to pollute streams and lakes if run off occurs.

To best reduce nutrient losses and prevent pollution:

- Incorporate surface applied manure within 24 hours, and
- Do not spread manures on frozen or snow covered ground.