For information or assistance with *management options*, contact your local:

- Conservation District,
- Cooperative Extension Service, or
- Natural Resources Conservation Service.

South Dakota Association of Conservation Districts
P.O. Box 275
Pierre, SD 57501-0275
(800) 729-4099
Fax: (605) 895-9424
www.sdconservation.org
info@sdconservation.org

USDA Natural Resources Conservation Service
Federal Building
200 Fourth Street SW Huron, SD 57501
(605) 352-1200
Fax: 605-352-1270
www.sd.nrcs.usda.gov
publicaffairs@sd.usda.gov

South Dakota Cooperative Extension Service/South Dakota State University

Department of Agricultural and Biosystems Engineering
Box 2120, SDSU
Brookings, SD 57007
(605) 688-5144
Fax: (605) 688-6764
charles_ullery@sdstate.edu

Department of Plant Science
Box 2207A, SDSU
Brookings, SD 57007
(605) 688-4772
Fax: (605) 688-4667
james_gerwing@sdstate.edu

South Dakota Department of Agriculture
Office of the Secretary
Foss Building, 523 E. Capitol, Pierre, SD 57501
(800) 228-5254 · (605) 773-3375 · Fax: (605) 773-4003
www.state.sd.us/doa

For information or assistance with *regulatory requirements*:

South Dakota Department of Environment and Natural Resources
Surface Water Quality Program
Foss Building, 523 E., Capitol Avenue
Pierre, SD 57501-3182
(800) GET-DENR ·(605) 773-3351 ·Fax: (605) 773-5286
www.state.sd.us/denr/DES/surfacewater/feedlot.htm

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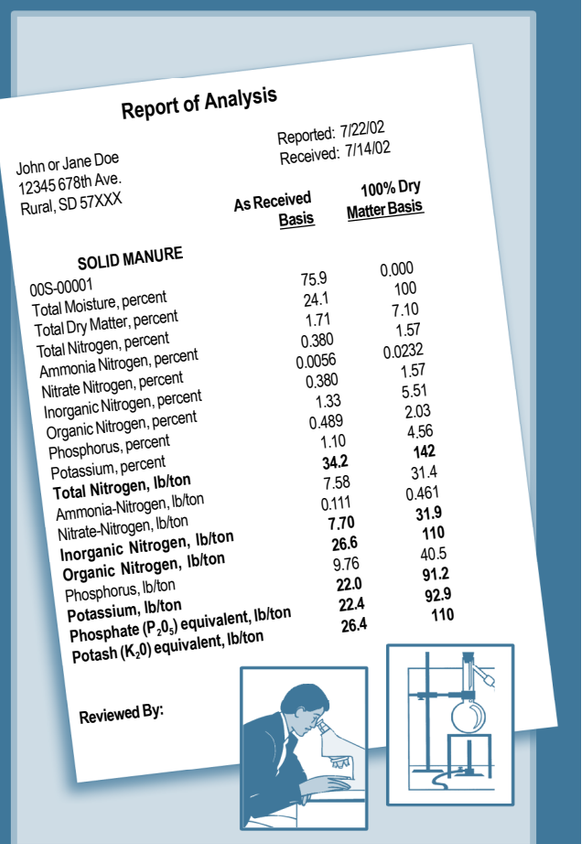
Programs and services are available to everyone on a nondiscriminatory basis.

SD-NRCS-FS-38 · March 2003

Using Manure Analysis Results



MANURE AS A RESOURCE SERIES

Using Manure Analysis Results

Livestock manure is a valuable resource. When applied to cropland, manure:

- provides nutrients for crop production,
- improves soil structure and water holding capacity, and
- reduces 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 uptake by the crop prevents nutrient buildup and helps prevent surface and ground water pollution.

Nutrient management plans include:

- yield goals for the crops to be grown,
- plant nutrients needed to reach the goals,
- soil test results for each field,
- an estimate, based on a lab analysis, of the nutrients that will be supplied by manure
- credits for nutrients supplied from other sources such as legumes,
- the amount of commercial fertilizer required to meet the remaining crop production needs, and
- identification of areas where manure should not be applied.

For information about sampling manure and calibrating application equipment see:

"Sampling Manure for Nutrient Management" (SD-NRCS-FS-36) and "Calibrating Manure Spreader Application Rates" (SD-NRCS-FS-43). Brochures are available on SD DENR's website. Visit:

http://www.state.sd.us/denr/DFTA/WatershedProtection/WQInfo.htm

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

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

Poorly handled samples do not provide an accurate estimate of the nutrients contained in the manure. Improperly calibrated equipment will result in over or under applying manure. Making either mistake can be costly:

- expected nutrients from manure may be insufficient to reach yield goals,
- more, or less, commercial fertilizer than needed could be applied, and
- nutrient build up in the soil may affect future manure applications to the field.

Worksheets for preparing a nutrient management plan are available at Cooperative Extension Service, Natural Resources Conservation Service, and conservation district offices, or by visiting:

http://www.state.sd.us/denr/DES/Surfacewater/ManureMgt/Tools.htm

NUTRIENT AVAILABILITY

The nitrogen, phosphorus and potassium in manure are present in two forms:

- organic compounds and
- inorganic compounds.

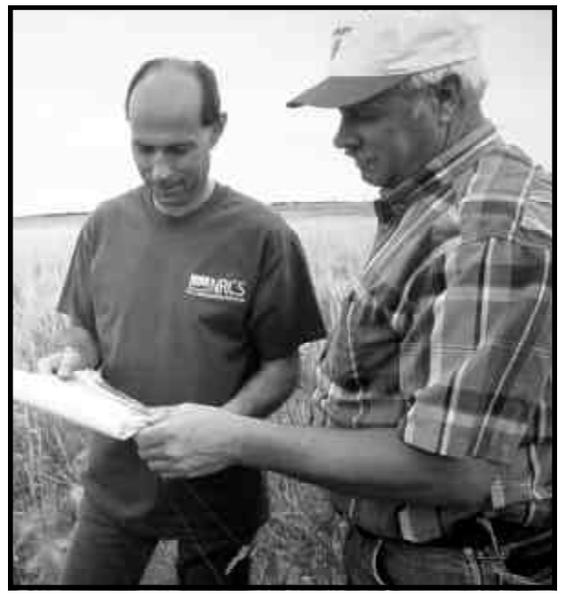
Nutrients become available for plant growth when organic compounds decay. During the decay process, bacteria and fungi convert the organic compounds to inorganic compounds by a process called mineralization. The rate of mineralization is affected by temperature, moisture, soil chemistry and time. Therefore,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

Mineralization occurs most rapidly in warm, moist, neutral to slightly alkaline soils. For South Dakota, a common rule of thumb for nitrogen mineralization is:

About one-third of the organic nitrogen becomes available each year for three years following a manure application.

The South Dakota Experiment Station found the following amounts of the nutrients are usually available for crop production during the year the manure is applied:

- Inorganic Nitrogen 100 percent
- Organic Nitrogen 35 percent
- Phosphorus 80 percent
- Potassium 100 percent



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. The test results are usually reported:

- as a percent by weight per ton or 1,000 gallons, or
- on both an "**As Received**" and "**Dry Matter**" basis.

The cover of this publication shows a report format used by many laboratories.

Manure is normally applied in the form it was sampled. Therefore, the "**As Received**" results must be used to plan a manure application. If "**As Received**" values are not provided by the lab, "**Dry Matter**" values can be converted to "**As Received**" using the following formula:

Formula for the Conversion Of "Dry Matter" to "As Received"

$$\%N_{AR} = \frac{\%N_{DM} \times \%\ DM}{100}$$

Where:

N_{AR} = % Nutrient As Received
N_{DM} = % Nutrient Dry Matter Basis
DM = % Dry Matter

For example, using the formula to convert dry matter nitrogen to **"As Received"** for the sample analysis shown on the cover:

$$\%N_{AR} = \frac{142 \times 24.1}{100} \qquad \%N_{AR} = 34.2$$

Fertilizer recommendations are based on the:

- inoganic (N) nitrogen and
- phosphorus (P_2O_5) and potash (K_2O) oxide equivalents

If the analysis report does not provide phosphorus and potash equivalents, the values can be determined using the formulas shown below. Each formula is accompanied by an example using numbers from the sample lab report shown on the cover:

lbs. P_2O_5 = Lbs. Phosphorus x 2.29
22.4 = 9.76 x 2.29

lbs. K_2O = Lbs. Potassium x 1.20
26.4 = 22.0 x 1.20

CALCULATING THE NUTRIENT VALUE OF MANURE AS FERTILIZER

The fertilizer value of manure is calculated using information provided by the laboratory report. Using the report shown on the brochure cover as an example, the fertilizer value is:

Fertilizer Values *(lbs./ton)*

Nitrogen:	Inorganic Nitrogen	7.7
	+ Organic Nitrogen (26.6 x 0.35)	9.3
	Total Nitrogen	17.0
Phosphorus:	P_2O_5 equivalent (22.4 x 0.80)	17.9
Potassium:	Potash (K_2O) equivalent	26.4

The example shows only the estimated nutrients available for crop production during the year the manure was applied. It does not account for nutrients lost during application.

The nutrients from manure applied during the previous two years must also be considered in a nutrient management plan (see Nutrient Availability section).

The method used to apply manure and the length of time between application and incorporation reduces the nutrients available for plant growth. Producers can expect a one to five percent nitrogen loss with same day incorporation or a knifing application. After four days, the nitrogen content of manure left on the soil surface may decrease by as much as 30 – 40 percent through volatilization. Thirty percent of the nitrogen content of manure applied through sprinkler irrigation systems is commonly lost to the atmosphere.

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

To reduce nutrient losses and prevent pollution:

- incorporate surface applied manure within 24 hours, and
- do not spread manure on frozen or snow covered ground.