TECHNICAL NOTES

NATURAL RESOURCES CONSERVATION SERVICE – WYOMING

AGRONOMY NO. 13 **APRIL 14, 2000**

SUBJECT: Fall/Snow Manure Application Guidelines

The following guidelines shall be followed for fall manure applications, as well as when applying manure on snow. This information will be incorporated into the 590 and 633 standards upon their revision later this year.

1 – Soil Test

An annual soil test will be required for each field where a fall/snow application of manure is to be considered. If residual nutrient levels (typically NO_3^- – N, but possibly P_2O_5 as well) indicate adequate or excessive plant requirement levels for expected yield, fall manure application will not occur on that particular field. Manure application at any time of the year will not occur on these fields until such time as soil test levels indicate that residual nutrient levels have been reduced to a point where additional nutrients need to be supplied to meet plant growth needs.

To facilitate the completion of a Waste Utilization/Nutrient Management Plan, the producer should provide the following minimum soil test information:

1 – soil texture
2 – organic matter percentage
3 – lime estimate
4 – soil paste pH
5 – salt estimate
6 – phosphate – P (using Olsen/NaHCO3 extraction process)
7 – nitrate – N
8 – potassium

To insure proper soil sampling technique and sample handling, the guidelines on the attached Soil Sampling Jobsheet should be followed.

When soil test results are taken from soil depths other than 0 – 1 and 1 – 3 feet, analyze the data to determine the applicability of using a weighted average from the varying depths.

2 – Manure Test

A manure test no more than 3 years old will be required if fall/snow application is to be considered. If feed rations change, a new manure test should be supplied. If fall application is to be made, it is essential to quantify the amounts of nutrients present in the manure.

To facilitate the completion of a Waste Utilization/Nutrient Management Plan, the producer should provide the following minimum manure test information:

1 – total nitrogen - should be represented as lb/ton
2 – nitrate nitrogen – should be represented as lb/ton
3 – urea nitrogen – should be represented as lb/ton
4 – phosphorous – as lb/ton
5 – potassium – as lb/ton
6 – moisture percentage
7 – bulk density (if available)

To insure proper manure sampling technique, and sampling handling, the guidelines on the attached Manure Sampling Jobsheet should be followed.

3 – Agronomic Rate
All manure applications will be made at agronomic rates. Agronomic rates will be determined using:

1 – realistic crop yield goals. Taking a 5-year average, discarding the high and low yields and adding 5% for potential yield increases due to varietal improvement is the recommended way to determine realistic yields.
2 – residual nutrient soil test values
3 – nutrient availability from Ag waste
4 – limiting nutrient – see #4 below
5 – Agronomy Tech Note # 10 (Wyoming Guide to Fertilizer Recommendations)

The NRCS in conjunction with USU and CSU will try to provide pictures of various application rates to producers

4 - Limiting Nutrient
In almost every scenario, phosphorous will be the limiting nutrient. However, the use of soil test phosphorous limits will sometimes allow nitrogen based application rates.

1 – soil test phosphorous limit. Simply put, once soil test P_2O_5 values exceed a threshold level, manure application would be phosphorous-based. The following table represents the soil test phosphorous limits and the associated application rates:

Soil Test Phosphorous Level	P Soil Test Level (ppm from Olsen)	Phosphorous Application
Low	<4.0	Nitrogen based
Medium	4.1 – 8.0	Nitrogen based
Optimum	8.1 –16.0	Phosphorous based (up to 1.5x crop removal
High	16.1 – 35.0	Phosphorous based (up to crop removal)
Excessive	> 35.0	No application

The required annual soil tests will allow for review of soil test phosphorous levels, and possible modification of application rates.

Producers and persons preparing Nutrient Management/Waste Utilization Plans should recognize the probable need for nitrogen fertilizer when applying wastes at phosphorous-based rates.

5 – Soil Temperature
Most literature indicates that soil microbial activity ceases at between 50 and 41 degrees Fahrenheit. Continued mineralization and nitrification of organic matter (be it crop residues or manure) ultimately results in the creation of nitrate. Once this nitrate is formed, and there is no opportunity for plant uptake, it is readily available to be leached through the soil profile by excess water. This scenario is very common in western Wyoming, where the historic precipitation patterns indicate annual excess winter moisture of 8.55 inches (the average precipitation minus potential evapotranspiration for October through April at Afton). If fall application is to be technically defensible, fall applications should only be made only on soils that are below 45 degrees Fahrenheit, but never when soil temperatures are above 50 degrees Fahrenheit near the end of the growing season.

Local Conservation District in cooperation with the NRCS may wish to explore the installation of thermocouples (at depths of 4-6 inches). Once these temperature readings indicate adequate soil cooling at the proper depth, fall applications would be considered. Operators may record their own soil temperatures and record this as part of their record keeping system.

6 – "Stockpiling" Nutrients
As per number 3, all applications should be made at agronomic rates. Application of nitrogen above single-year agronomic rates will not be allowed. As per number 4 above, some application rates may allow application of phosphorous above agronomic rates.

7 – Application on snow
In addition to the guidelines presented in 1- 6 above, the following additional guidelines will apply when application on snow is to be considered.

- no liquid wastes will be applied on snow
- no solid wastes will be applied on slopes greater than 3%
- no solid manure will be applied within 300 feet of the nearest downstream surface water body
- manure can be spread on snow until such time as site conditions and/or equipment limitations, preclude application at agronomic rates

Soil Sampling Guidelines/Jobsheet

The information presented below is from Colorado State University Bulletin No. 0.500 and from the University of Wyoming Bulletin No. B-1045.

Consider each of the following before obtaining a soil sample:

1 – field area (acreage) per sample
2 – sampling procedure
3 – sampling depth
4 – when to sample
5 – sampling tools
6 – sample handling

Field Area
A composite soil sample should represent a uniform field area. Each area should have a similar crop and fertilizer history for at least the last two years.

Exclude small areas within a field that are obviously different. These odd areas can be sampled separately if they are large enough to warrant special treatment. The field area represented by a single composite sample should be no more than 40 irrigated acres or 100 dryland acres. Fewer acres are better.

Sampling Procedure
Use a systematic sampling scheme. Grid the area in your mind's eye and sample once within each grid. Also consider obtaining copies of aerial photography of the area to be sampled from the NRCS. Obtain an accurate nutrient evaluation of a field site with a minimum of 15 to 20 subsamples from each sampled depth. Mix these subsamples thoroughly and save 1 pint for analysis. This pint mixture is the composite soil sample.

Sampling Depth
Where soil physical properties allow, take subsamples from the 0-12 inch depth and from the 13-36 inch depth. Where shallow soils preclude sampling to 36 inches, take samples from the deepest allowable depth and note the depth from which the sample came.

When to Sample
Sample fields before each cropping season and/or before the anticipated application of manure. Allow enough time between sampling and manure application for sample analysis and interpretation.

Tools
A stainless steel soil-sampling probe (moisture probe) is recommended for obtaining a soil sample. A shovel is satisfactory for sampling, though it will take more time. Tools must be clean and free of rust. Collect the subsamples in a plastic bucket or stainless steel container. Do not use galvanized or brass equipment of any kind.

Handling
Air-dry soil samples within 12 hours of collection. Air drying samples prevents microbes from mineralizing soil organic matter that can cause less accurate nitrogen fertilizer recommendations.

Tract No.	Field No.	Field Acres	Sampled Depth	Date Sampled	Date Submitted	Laboratory

Manure Sampling Guidelines/Jobsheet

Consider each of the following before obtaining a manure sample:

1 – manure pile/bunker sample
2 – sampling procedure
3 – sampling depth
4 – when to sample
5 – sampling tools
6 – sample handling

Manure Pile/Bunker
A Composite manure sample should represent the bunker and/or manure pile.

Sampling Procedure
Scrape away the top 4-6 inches from the pile/bunker. Obtain an accurate nutrient evaluation of manure with a minimum of 10 to 12 subsamples from the pile/bunker. Mix these subsamples thoroughly and save 1 pint for analysis. This pint mixture is the composite manure sample.

Sampling Depth
Take subsamples from various depths within the pile/bunker, but always avoiding the exposed top 4-6 inches.

When to Sample
If care is taken when obtaining subsamples, timing of manure sampling is not critical. Allow enough time between sampling and manure application for sample analysis and interpretation.

Tools
A stainless steel soil-sampling probe (moisture probe) is recommended for obtaining a manure sample. A shovel is satisfactory for sampling, though it will take more time. **TOOLS MUST BE CLEAN AND FREE OF RUST**. Collect the subsamples in a plastic bucket or stainless steel container. Do not use galvanized or brass equipment of any kind.

Handling
Air-dry or freeze manure samples within 12 hours of collection. Air drying or freezing samples prevents microbes from mineralizing organic matter that can cause less accurate nitrogen fertilizer recommendations.

Date Sampled	Date Submitted	Laboratory