Laboratory Sampling of Manure Materials:

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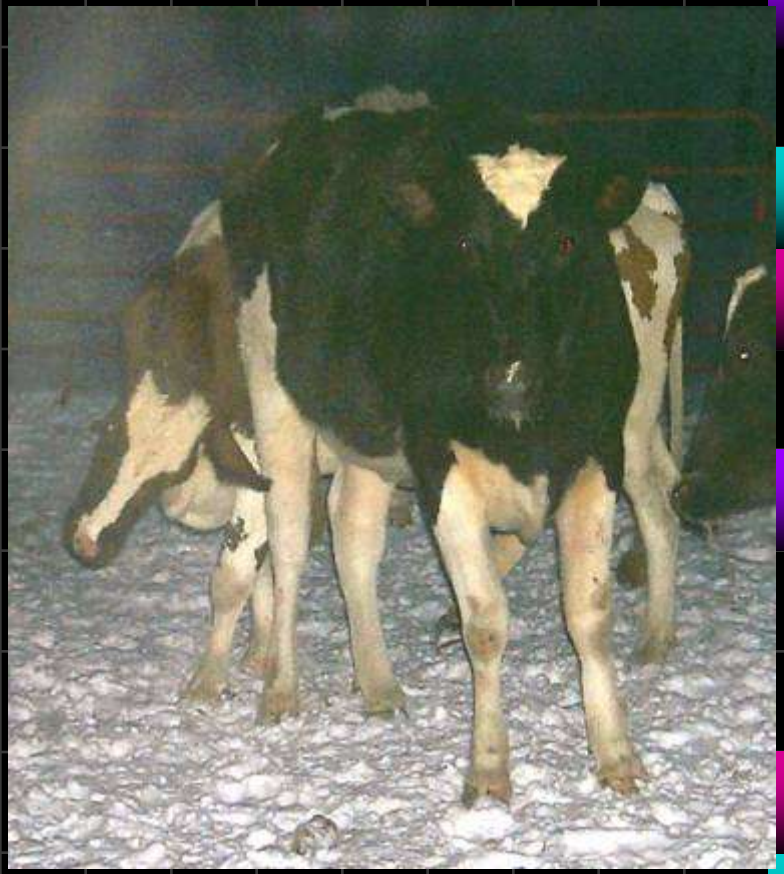
University of Wisconsin – Madison

Introduction

- Nutrient concentrations can be estimated using “book” values for available N, P_2O_5, and K_2O
- Manure testing takes management practices into account and delivers more accurate values
- Sampling technique greatly influences test results
- Sample handling and testing methods also affect analytical results

Sources of Manure Nutrient Content Variability

- Animal species
- Management
  - Bedding
  - Storage Type
  - Time
- Sampling technique
- Laboratory
  - Sample Preparation
  - Method



Must take a good and representative sample


Attempt to minimize the variability in technique

Effect of In-Lab Variability on Total Nutrient Content of Manure

Material	No. of Analysis		Nutrient* DM	N	P	K
			%			
Liquid Dairy Manure #3	4	Mean	7.13	4.25	1.04	3.63
		SD	0.08	0.09	0.03	0.04
Liquid Dairy Manure #4	4	Mean	6.05	4.65	1.28	4.07
		SD	0.09	0.05	0.05	0.04

*** Dry Weight Basis, University of Wisconsin Soil and Forage Analysis Lab - Marshfield**

Effect of In-Lab Variability on Total Nutrient Content of Manure

Material	No. of Analysis		Nutrient* DM	N	P	K
			%			
Poultry (fresh)	8	Mean	28.14	6.31	1.76	3.08
		SD	0.15	1.12	0.04	0.05
Dairy semi-solid (fresh)	8	Mean	14.14	3.75	0.83	3.27
		SD	0.14	0.26	0.02	0.03

*** Dry Weight Basis, University of Wisconsin Soil and Forage Analysis Lab - Marshfield**

Composite and subsample properly

Sample Identification and Delivery

- Identify container and information sheet with following information:
  - Farm name / owner's name and address
  - Animal species and storage system
  - Date
- Also include application method on information sheet
- Keep samples frozen until shipped or delivered
- Ship early in the week (Mon – Wed) to avoid holidays and weekends

Spread the manure uniformly

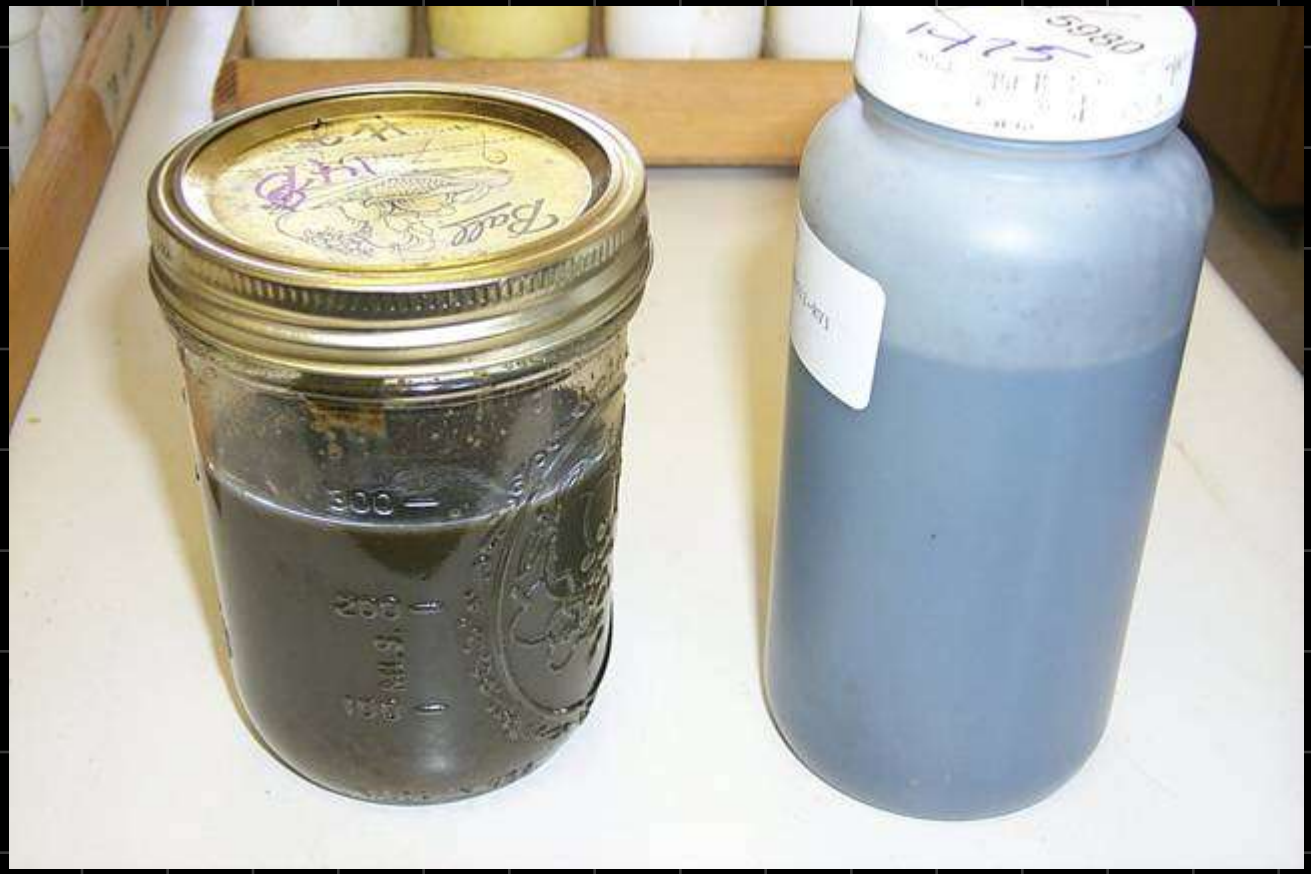
Table of Contents – Lab Procedures

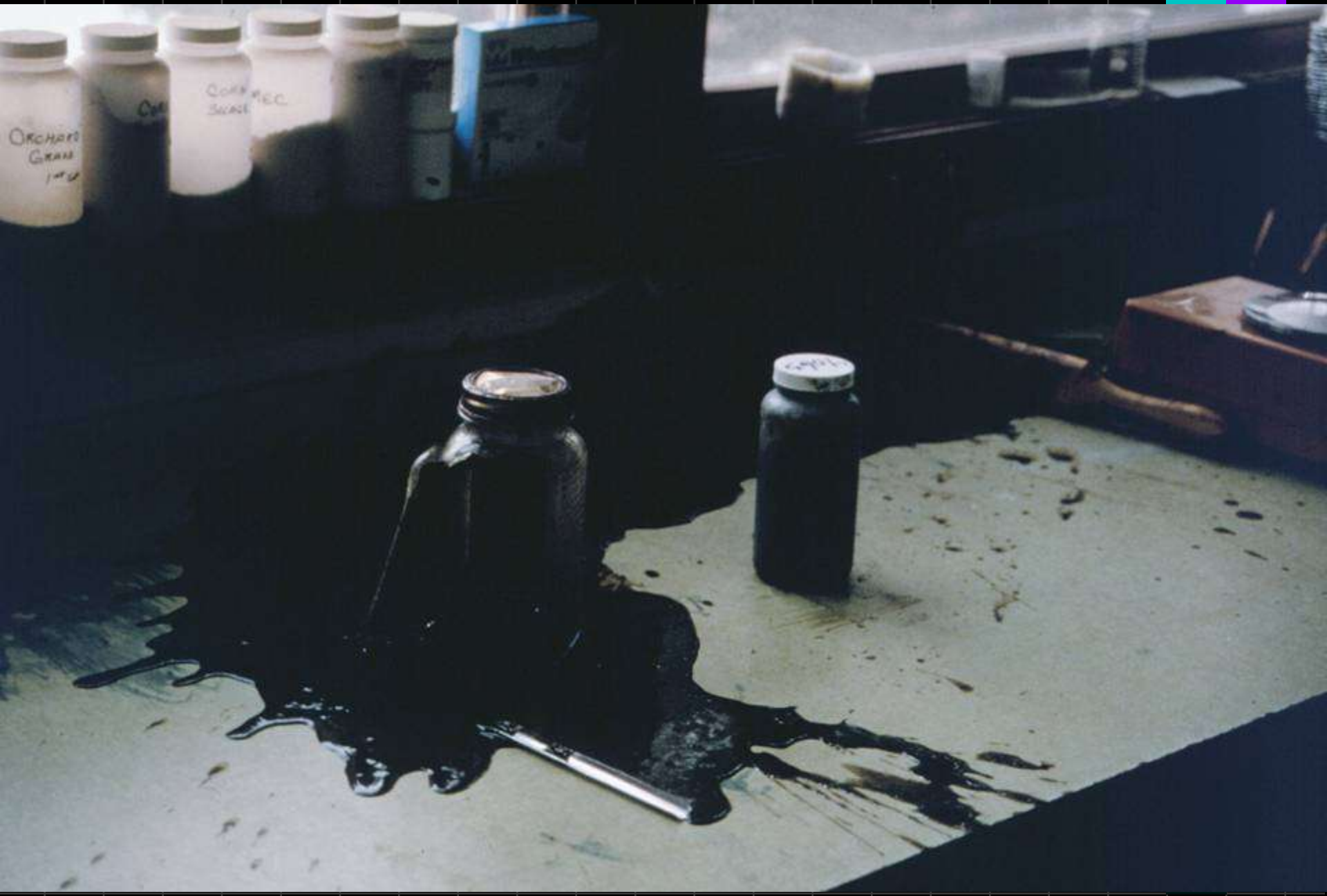
Sample Handling

- Biohazards and laboratory safety
- Sample receiving, examination and transfer
- Sample stabilization and storage
- Sample holding times
- Homogenizing and subsampling
- Archiving and disposal

Samples come in many different types of containers

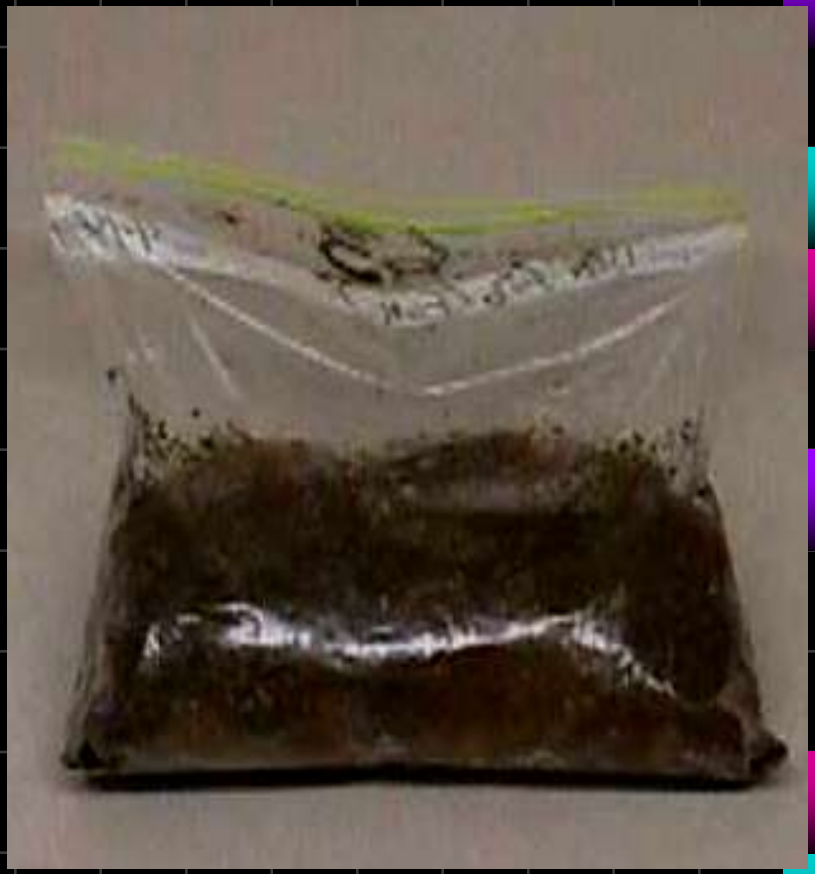
Sample Containers – Plastic recommended




ORCHARD
GRASS

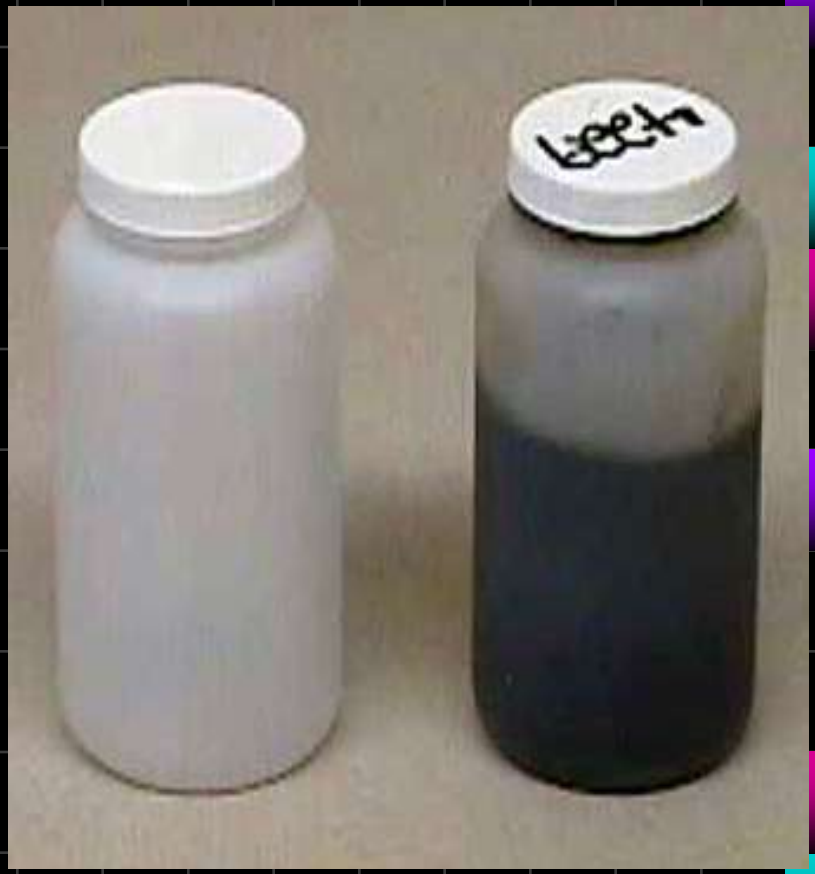
Sample Storage and Handling

- Solid/Semi-solid samples
  - Thoroughly mix composite sample
  - Fill a one-gallon heavy-duty ziplock bag approximately one-half full
  - Squeeze out excess air, close and seal
  - Store sample in freezer if not delivered to the lab immediately



Sample Storage and Handling

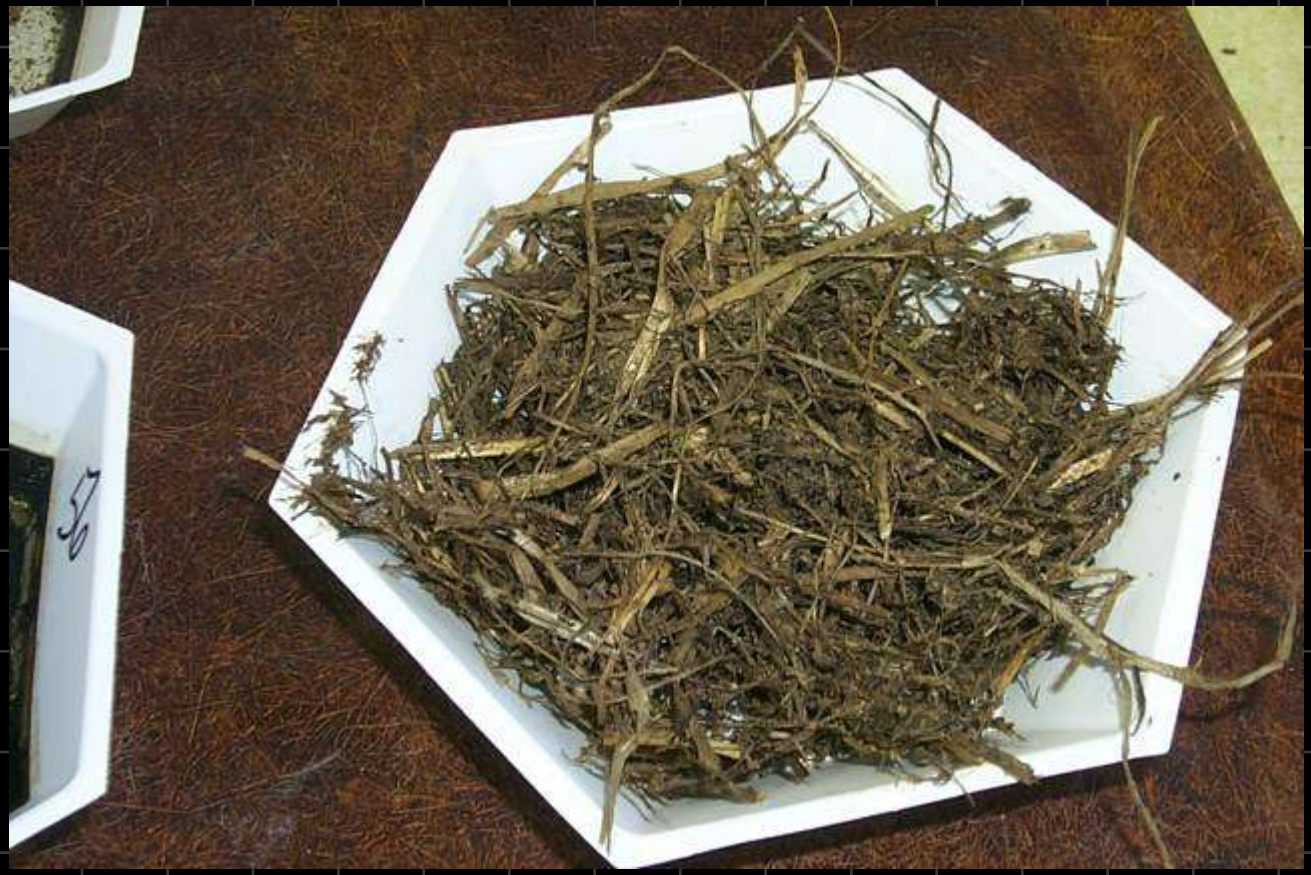
- Liquid samples
  - Thoroughly mix composite sample
  - Fill a one-quart plastic bottle not more than three-quarters full
  - Store sample in freezer if not delivered to the lab immediately



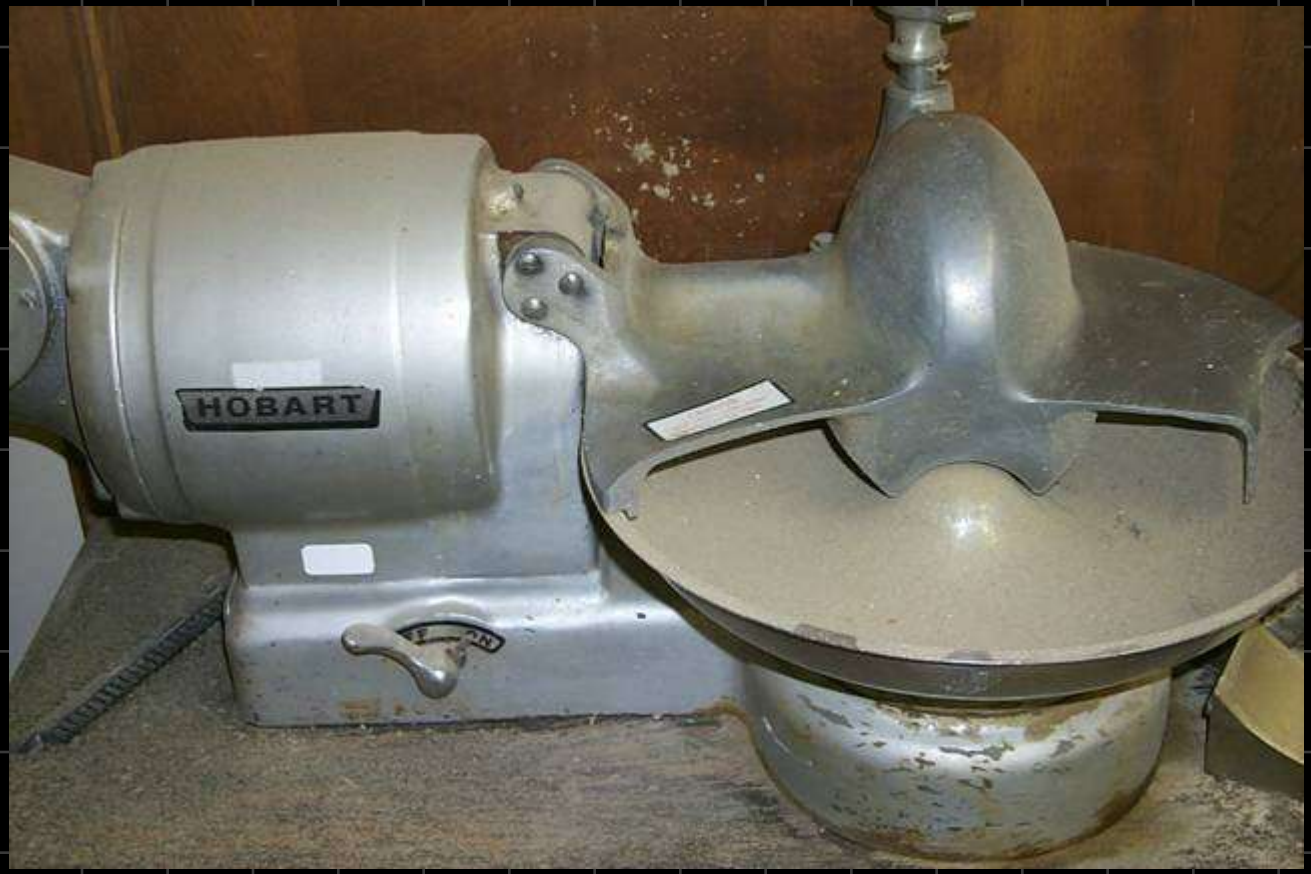
Samples following overnight drying

High dry matter – long straw
DIFFICULT TO SUBSAMPLE

Long bedding sample



“Salad” chopper used for long straw

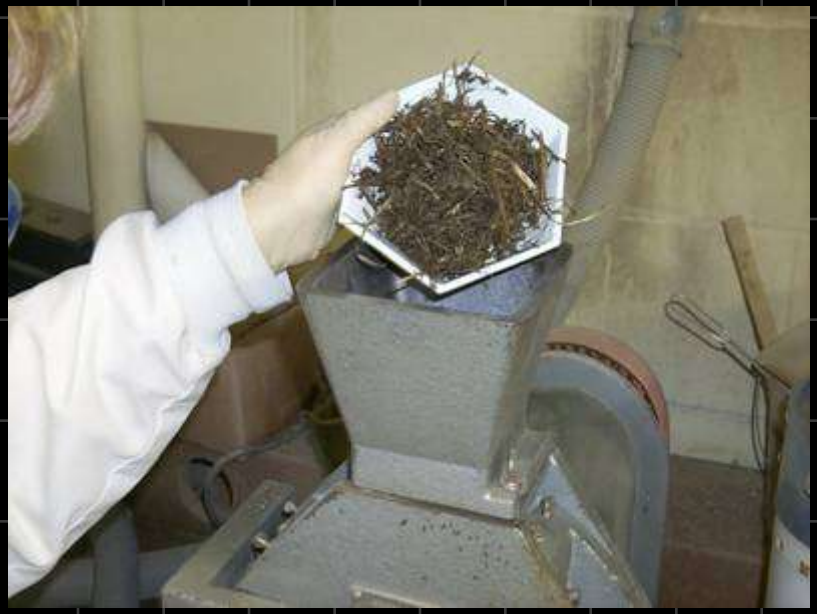


Dry matter determination

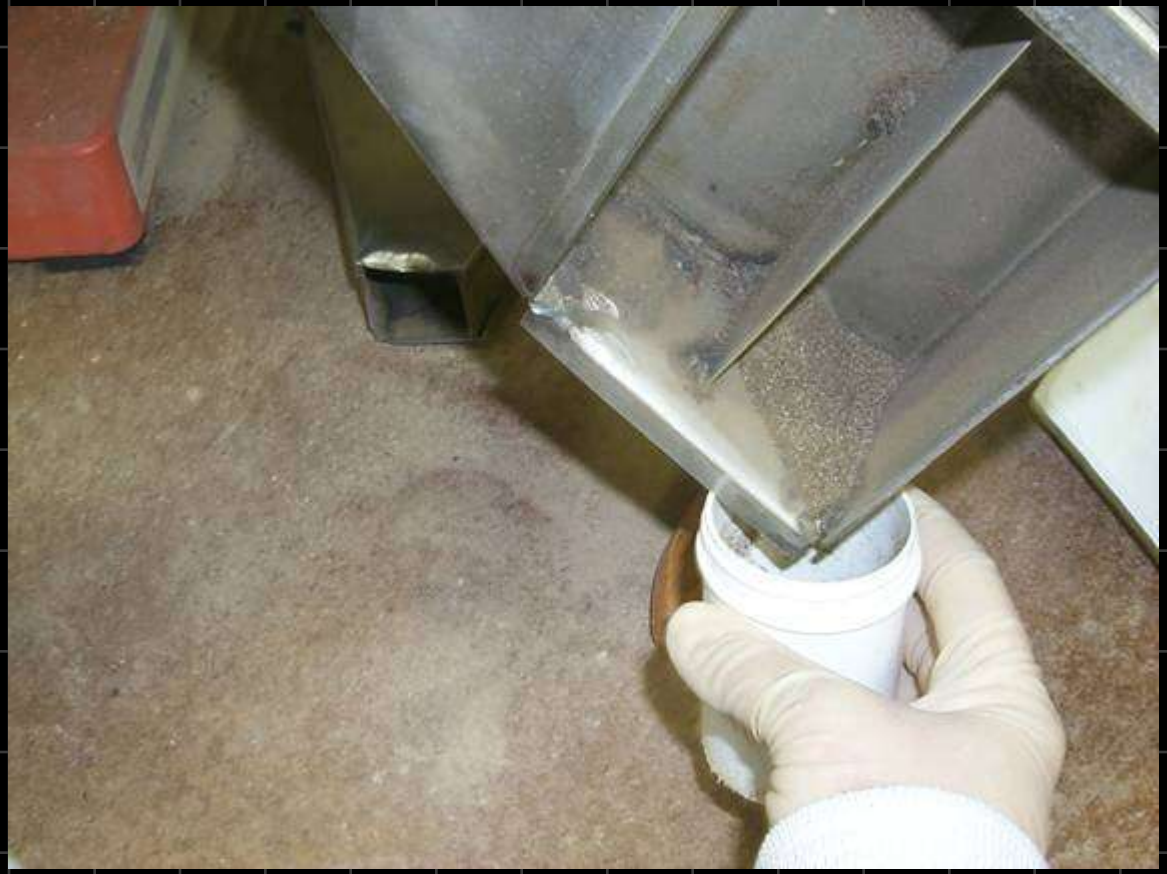
High vs. Low dry matter sample

2mm Wiley grind for solid samples

Oven dry samples dried in Wiley mill

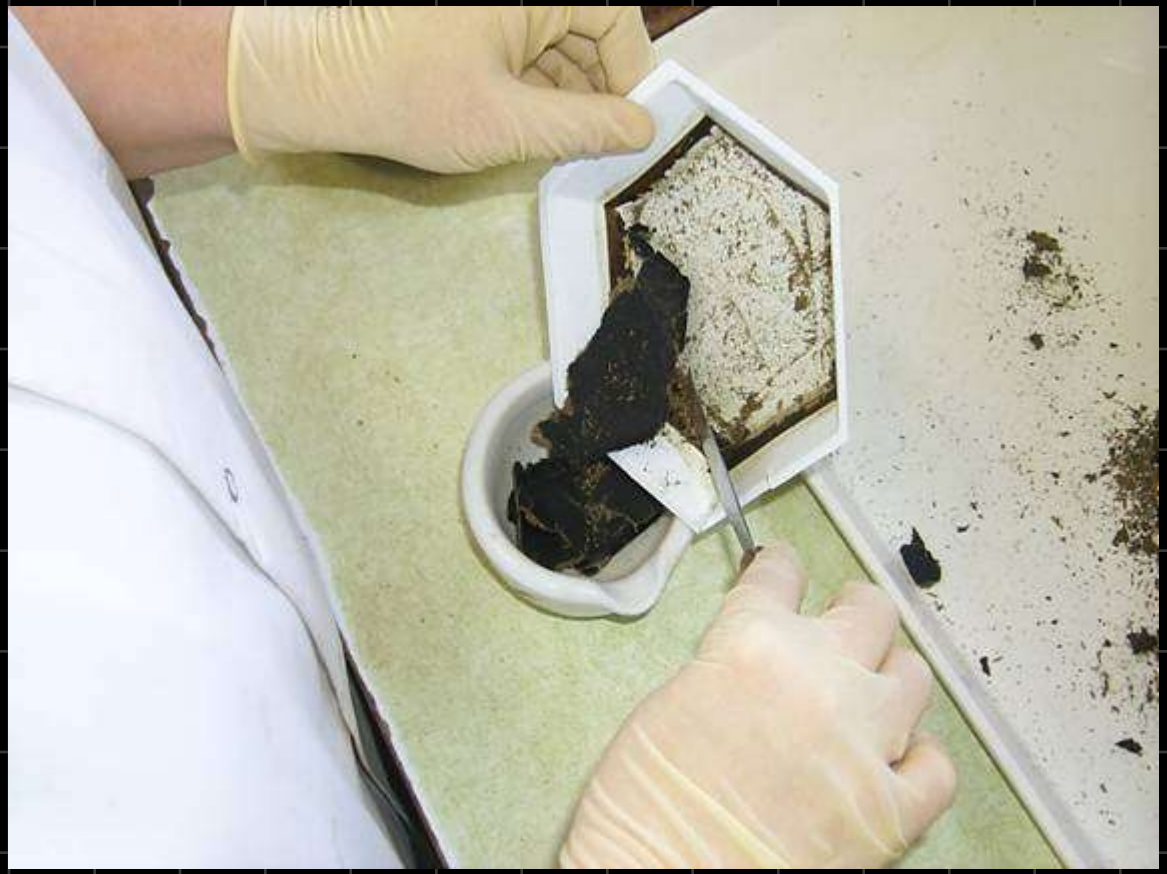


Ground sample saved in plastic bottle

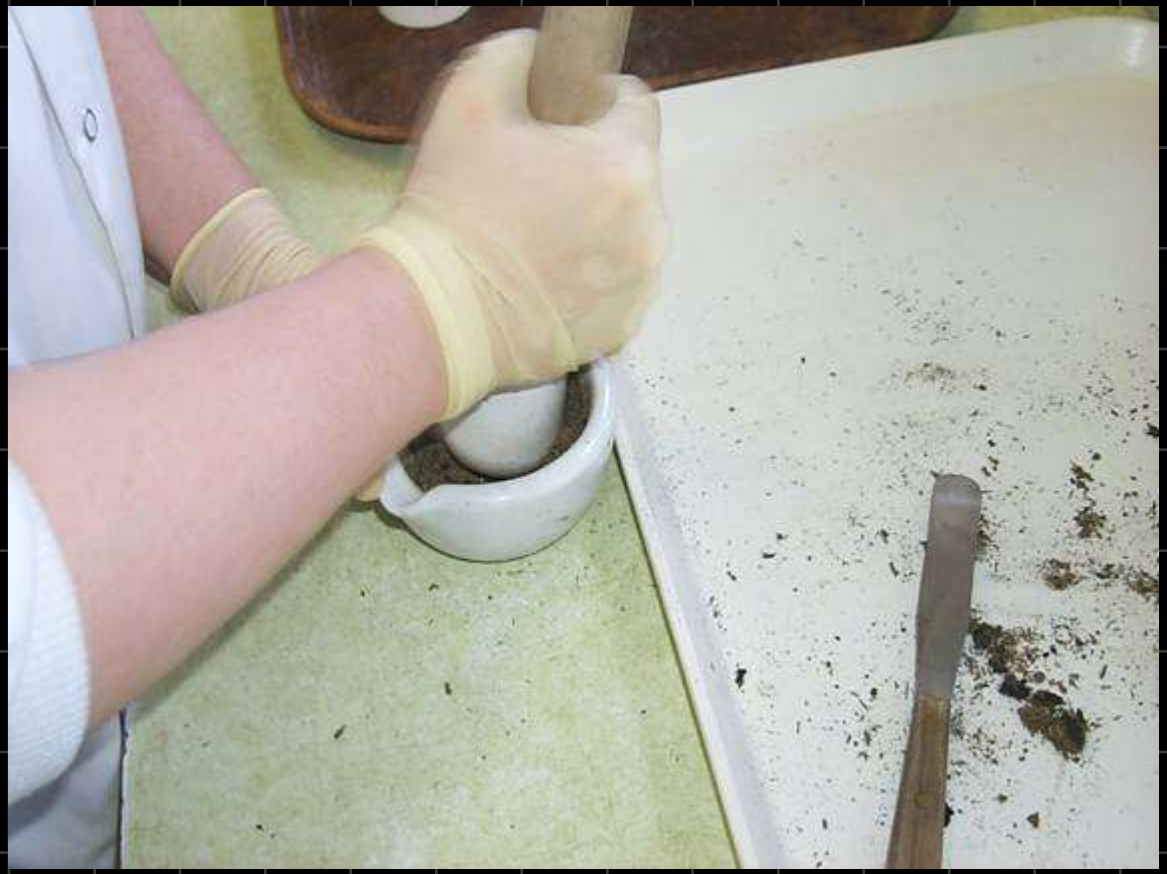


Dried and ground sample archived

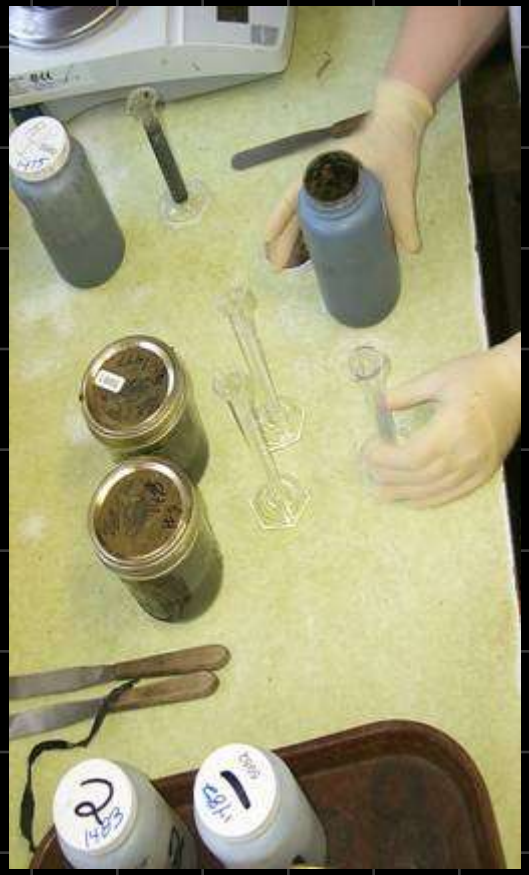
Liquid sample – scraped following drying



Liquid samples ground by hand



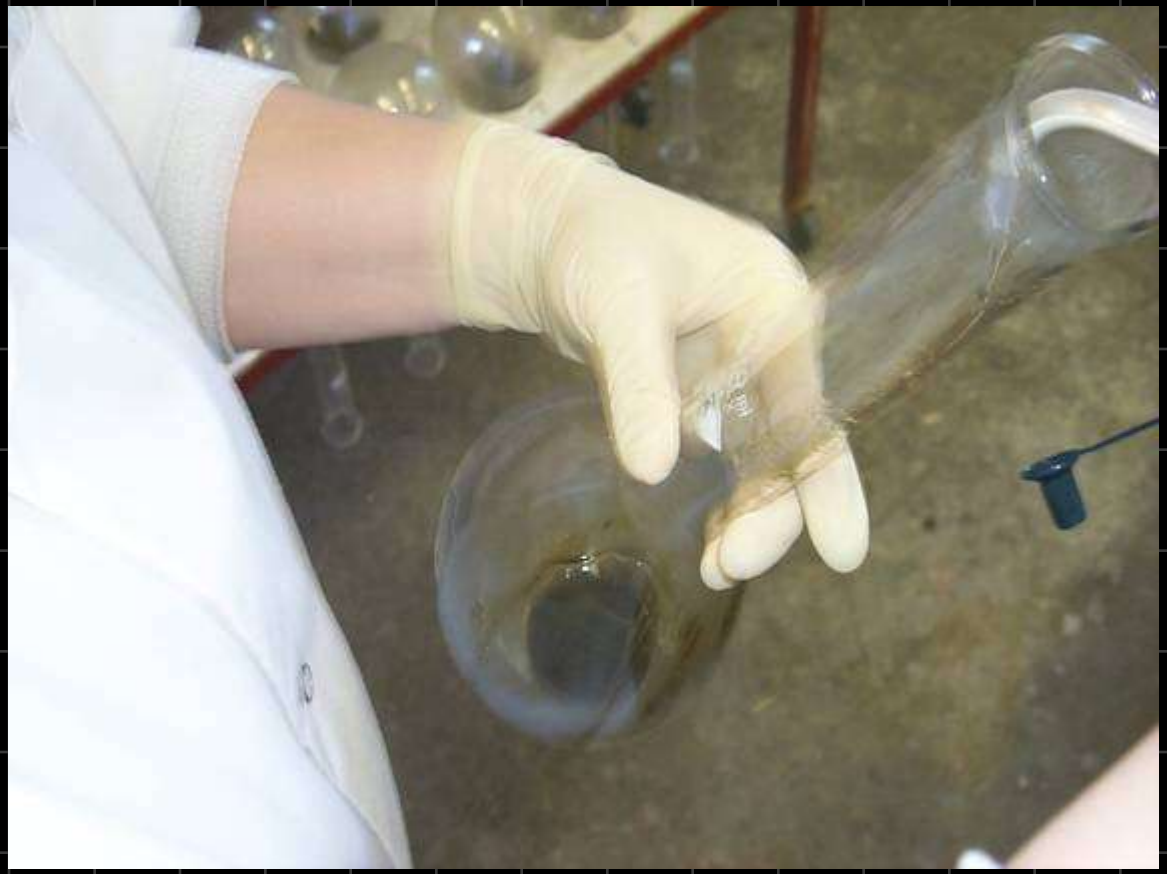
Subsampling liquid samples for N



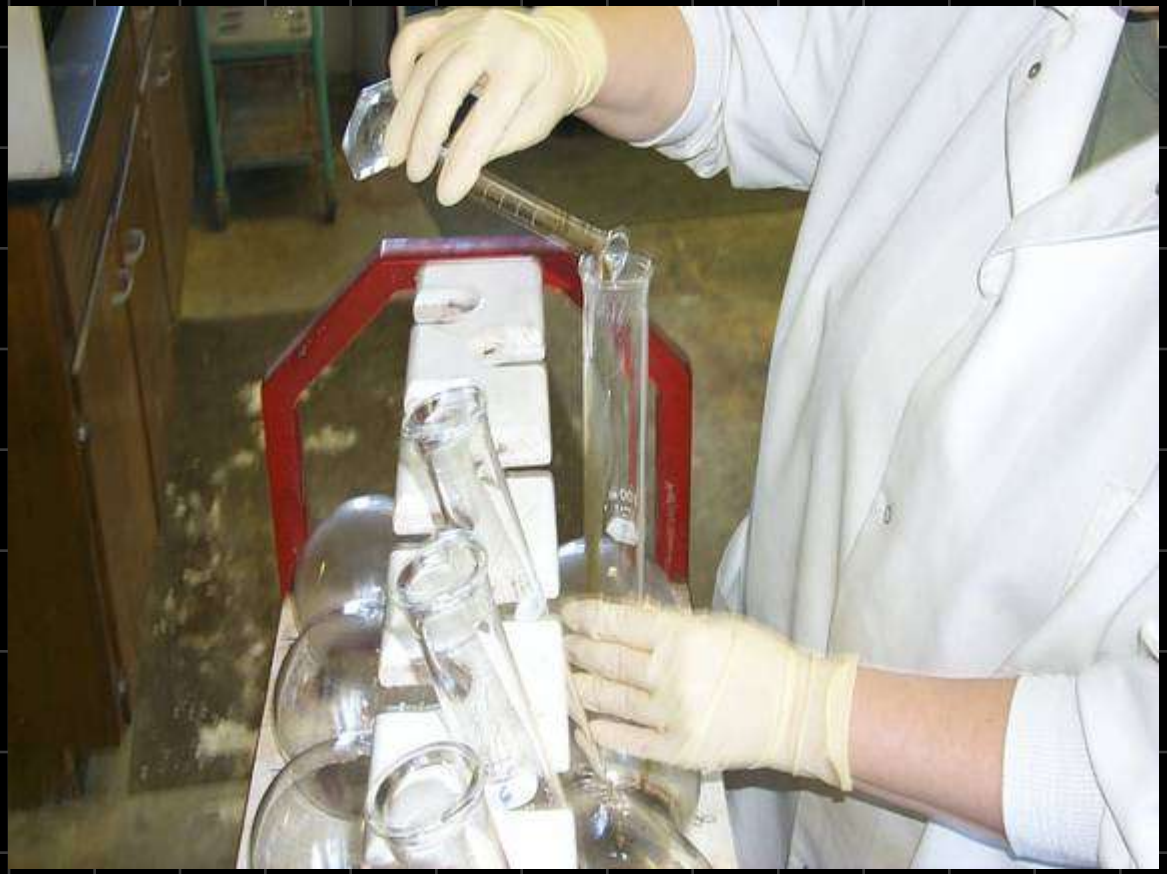
Approximately 10mls/10g used

Sulfuric Acid added to digestion flask

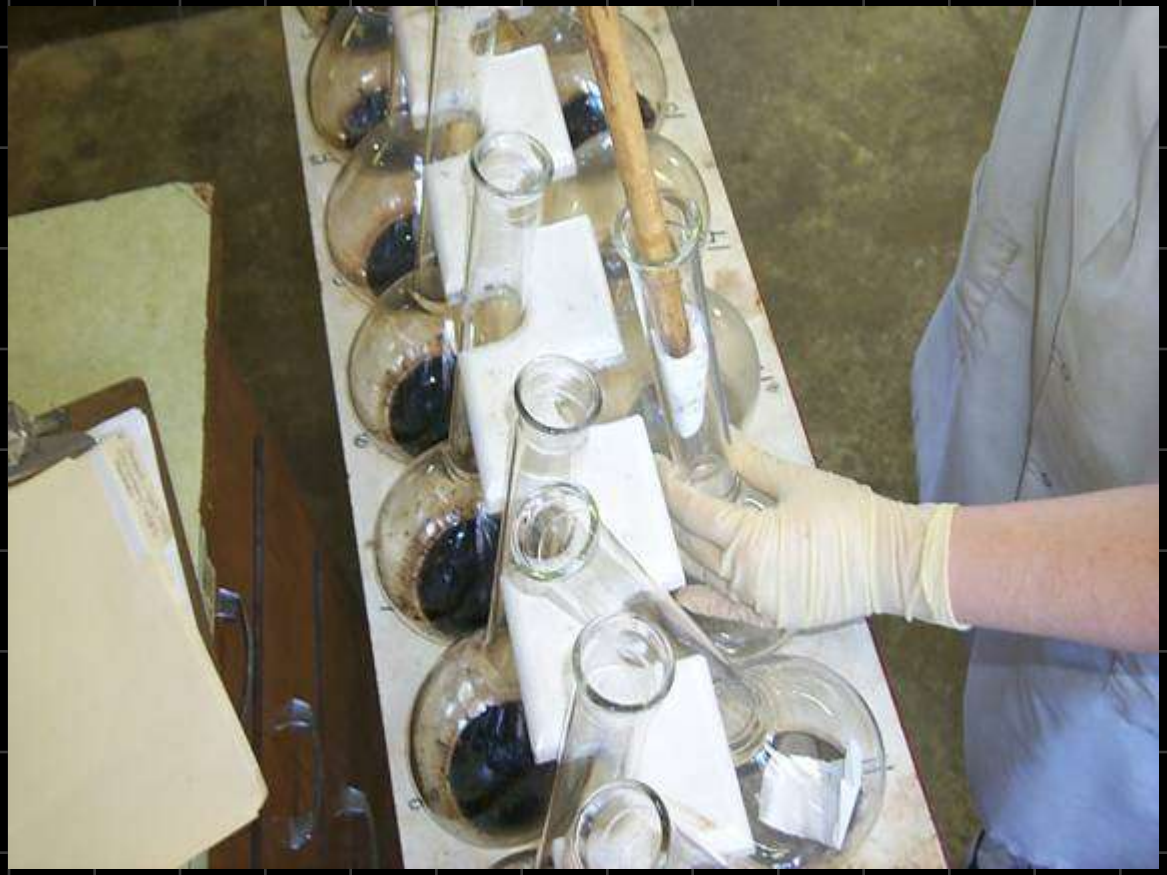
Acid used to wash down neck of flask



Manure added to flask and cylinder re-weighed to determine sample wt.



High DM samples added with filter paper



Macro Kjeldahl flasks with acid added

Samples archived in freezers

Samples Analyzed By:

SOIL & FORAGE ANALYSIS LAB
8396 YELLOWSTONE DRIVE
MARSHFIELD, WI 54449

SOIL TEST REPORT

University of Wisconsin-Extension
University of Wisconsin-Madison
Soils Department, Madison, WI

LAB NO. 1-99999

County: WOOD
Account No.: 901
Date Received: 08/14/00
Date Processed: 14-Aug- 0
Field: 1
Acres: 5.0
Soil Name (or subsoil group): Withee
Plow Depth: 7.0

UW SOIL & FORAGE LAB
8396 YELLOWSTONE DRIVE
MARSHFIELD WI 54449

This Report is for:
UW SOIL & FORAGE LAB
8396 YELLOWSTONE DRIVE
MARSHFIELD WI 54449

NUTRIENT RECOMMENDATIONS

Cropping Sequence	Yield Goal	Crop Nutrient Need N	Crop Nutrient Need P_2O_5	Crop Nutrient Need K_2O	Fertilizer Credit Legume N	Fertilizer Credit Manure N	Fertilizer Credit P_2O_5	Fertilizer Credit K_2O	Nutrients to Apply N	Nutrients to Apply P_2O_5	Nutrients to Apply K_2O
	per acre	lbs/a			lbs/a	lbs/a			lbs/a		
Corn, grain	111- 130 Bu	120	25	65	0	20	15	45	100	10	20
Oats	61.0-90.0 Bu	40	15	90	0	8	3	8	33	12	83
Alfalfa	4.6- 5.5 T	0	65	290	0	3	1	3	0	64	288

The lime required for this rotation to reach pH 6.8 is 8.0 T/a of 60-69 lime or 6.5 T/a of 80-89 lime.

ADDITIONAL INFORMATION

First year replacement credit based on 2 years of non-incorporated Dairy 5.0 tons manure/acre.
If corn harvested for silage instead of grain, add extra 30 lb P2O5/A and 90 lb K2O/A to next crop.
Reduce nitrogen by 50% if barley or oats are underseeded with a legume forage.
If lime has been applied in the last 2 years, more lime may not be needed due to incomplete reaction.

A lime recommendation is calculated only when soil pH is more than 0.2 units below the optimum pH.

Starter fertilizer (e.g. 10-20-20 lbs $N-P_2O_5-K_2O$/a) is advisable for row crops on soils slow to warm in the spring.

A soil nitrate test may better estimate actual corn N needs.

If conservation tillage leaves more than 50% residue cover when corn follows after corn, add an additional 30 N lbs/a.

If alfalfa will be maintained for more than three years, increase recommended K_2O by 20% each year.

Summary

- The value of manure testing is highly dependant on sampling technique
- Sample handling and testing methods influence analytical results

Manure analysis conversions and constants

- 1 lb P = 2.29 P_2O_5
- 1 lb K = 1.20 lbs K_2O
- 1 gallon liquid manure = 8.3 lbs
- If dry matter is less than 11.5% - nutrient results are normally reported in lbs/1000 gal
- If dry matter greater than 11.5% - nutrient results are normally reported in lbs/ton
- To convert % to lbs/ton – multiply by 20
- To convert % to lbs/1000 gal – multiply by 83

Conversion factors between liquid and solid values

$$\frac{\text{lbs}}{\text{Ton}} \times 4.15 = \frac{\text{lbs}}{1000\ \text{gal}}$$

$$\frac{\text{lbs}}{1000\ \text{gal}} \times 0.24 = \frac{\text{lbs}}{\text{Ton}}$$