



Trends in Manure Sample Data




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Overview

- Worked with several labs to acquire some recent manure data
- Compared to Midwest Plan Service and American Society of Agricultural and Biological Engineers (ASABE) book manure nutrient values
- Identified general nutrient trends
- Preparations for nationwide manure nutrient database (ManureDB) creation
- Ideas on what we will have to work on to make ManureDB useful and user-friendly




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What are manure book values used for?





- Developing manure management plans
- Designing manure storages
- Establishing best management practices for manure land application
- Modeling nutrient cycling and gas emissions



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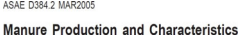
Manure Book Values

- Manure Characteristics
 - MidWest Plan Service (MWPS)
 - 2004
- Manure Production and Characteristics Standard
 - American Society of Agricultural and Biological Engineers (ASABE)
 - 2005



Manure Characteristics

MWPS



ASAE D384.2 MAR2005

Manure Production and Characteristics

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ASABE Manure Data



SWINE			
Deep Pit Slurry ISU Jaramilla (n = 24) ISU NIR data (n = 268) (1999 & 2000 data) Σ = 292	Flush water SE US data (Chastain)	Lagoon Surface Water SE US data (Chastain) Mo. Data ISU NIR data (n = 189) Σ = 189+	Agitated liquid & solids SE US data (Chastain)
POULTRY			
Pullets Patterson	Layer hens Patterson ISU (Lorimor & Xin, n = 48)	Broiler litter ISU (Mo & Okia samples, n = 95)	Turkey litter

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Preliminary Lab Data

- Five laboratories
 - Over 127,000 samples!
- Samples from 2012-2021
- Sorted between liquid and solid
- Divided into four main livestock groups
 - Beef
 - Dairy
 - Poultry
 - Swine





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What we did

- Lab results and book values had various units converted into:
 - lbs of nutrient/ton for solid manure
 - lbs of nutrient/1000 gallons for liquid manure
- Calculated medians of total nitrogen, NH₄-N, P₂O₅, and K₂O analyses
- No differentiations for most of these samples of:
 - Housing
 - Manure storage
 - Age


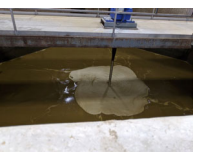



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Liquid Manure sample trends 2012-2021 compared to MWPS/ASABE manure book values.

(+) = trending higher
(o) = no change/conflicting samples
(-) = trending lower

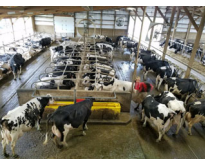
Liquid	Total N	NH ₄ -N	P ₂ O ₅	K ₂ O
Swine	o	o	-	+
Dairy	-	o	-	o
Beef	o	o	o	o
Poultry	o	+	-	+




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Dairy Liquid N




Livestock Type	Total N lbs/1000 gal of manure
MWPS	
Dairy Cow	31
Dairy Heifer	32
Dairy Calf	27
Dairy Herd	31
ASABE	
Dairy lagoon effluent	6
Dairy slurry	25
3 Midwest labs	
Dairy	20
1 East lab	
Dairy	24



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Dairy Liquid P



Livestock Type	P ₂ O ₅ lbs/1000 gal of manure
MWPS	
Dairy Cow	15
Dairy Heifer	14
Dairy Calf	14
Dairy Herd	15
ASABE	
Dairy lagoon effluent	3
Dairy slurry	25
3 Midwest labs	
Dairy	9
1 East lab	
Dairy	9

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Poultry Liquid P



Livestock Type	P ₂ O ₅ lbs/1000 gal of manure
MWPS	
Broilers	40
Pullets	35
Layers	52
Tom Turkeys	40
Hen Turkeys	38
3 Midwest labs	
Poultry	29

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Poultry Liquid K

Livestock Type	K ₂ O lbs/1000 gal of manure
MWPS	
Broilers	29
Pullets	30
Layers	33
Tom Turkeys	29
Hen Turkeys	32
3 Midwest labs	
Poultry	35

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Poultry Solid N

Livestock Type	Total N lbs/ton of manure
MWPS	
Broilers	46
Pullets	48
Layers	34
Tom Turkeys	40
Hen Turkeys	40
ASABE	
Poultry Leghorn Pullets	43
Poultry Leghorn Hen	37
Poultry Broiler Litter	75
Poultry Turkey Litter	44
3 Midwest labs	
Poultry	53
1 East lab	
Poultry	52



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Poultry Solid K

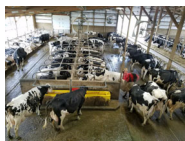
Livestock Type	K ₂ O lbs/ton of manure
MWPS	
Broilers	36
Pullets	27
Layers	26
Tom Turkeys	30
Hen Turkeys	30
ASABE	
Poultry Leghorn Pullets	27
Poultry Leghorn Hen	31
Poultry Broiler Litter	33
Poultry Turkey Litter	30
3 Midwest labs	
Poultry	37
1 East lab	
Poultry	40



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What we have learned


- Most samples have minimal descriptions beyond species of animal and little is known about storage types.
 - Age, nutrition, housing, manure handling and storage all can affect these nutrient levels
- Standardizing laboratory methods/units/terminology for manure samples will be important as we work to increase the number of laboratories and data in ManureDB.



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Future Plans



- Standardize fields for the future incoming samples
 - Location, manure type, agitation, species, bedding, storage type, and analytical method
- Create a unit conversion mechanism for data uploads
- Recruit more laboratories to participate in the ManureDB project
- Compare and analyze more data, especially more detailed data for each species
- Design ManureDB with statistical and data visualization features for future public use



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Summary

- Preliminary data from 5 labs showed changes in manure trends from published manure book values
- Detailed metadata will be key for future robust comparisons
- ManureDB construction underway







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Additional Information

ManureDB website:
<http://manuredb.umn.edu>
 (coming soon!)

Email: boh1b001@umn.edu

 @nlbb

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Acknowledgements

Additional Authors:

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