

Manure Testing for Proper Nutrient Management

By Manjula V. Nathan

Manure is a valuable source of nutrient for crops and improved soil productivity. Manure testing is necessary to make optimum use of manure nutrients while minimizing environmental impact of over application. Book values are of little use due to rapidly changing diets and the impact of farmer management on the nutrient content of manure. The EPA revised Concentrated Animal Feeding Operation (CAFO) rule (affecting permitted operations) and the Natural Resource Conservation Service (NRCS) Agronomy Standard (590) require annual testing of manure storages as part of the nutrient management planning process.

The MU Soil and Plant Testing Lab began offering manure testing services in 2008 to meet the increasing need for this service by our clients. The lab uses the recommended tests for manure analysis and reports results on as is basis. The lab also participates in the manure analysis certification program to ensure quality of results.

It is interesting to note the high degree of variation found in the samples received by the lab. Table 1 presents the manure nutrient analysis summary for the samples tested by MU soil and plant testing lab. Even though the standard book values for average nutrient contents are available, they are not of much value due to the variation that exists between manure storage and handling systems. This summary shows the variation found between different sources and manure handling systems (Table 1). The wide variability observed among samples received emphasizes the need for testing each source of manure so that the growers can have a better estimate of nutrients applied to the field and adjust the supplemental application of inorganic fertilizers accordingly. To get an estimate of plant available nitrogen and recommended application rate based on manure test results, method of application and target nitrogen rate, visit Dr. John Lory's Resources for Nutrient Management Planners website at: http://nmplanner.missouri.edu/tools/pan_calculator.asp.

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Table 1. Manure Nutrient Analysis Summary for Samples Received by MU Soil and Plant Testing Lab

Source		N % Wet Wt basis	P % Wet wt basis	K % Wet wt basis	NH4 ppm Wet wt basis	pH	EC	DM %	Moisture %
Poultry	MAX	4.54	3.94	5.19	16117.0	8.7	25.0	98.3	68.3
	MIN	0.29	0.09	0.27	733.0	5.0	4.7	31.7	1.7
	Mean	2.474	1.198	1.840	6394	7.40	15.44	63.5	36.5
	Range	0.29-4.54	0.09-3.94	0.27-5.19	733-16117	5.0-8.7	4.67-24.99	31.7-98.3	1.7-68.3
	Number	124	124	124	52	54	48	124	124
Dairy concrete pit	MAX	2.25	1.84	0.74	4713.00	8.08	27.80	53.30	99.23
	MIN	0.09	0.01	0.05	244	6.71	2.86	0.8	46.7
	Mean	0.572	0.235	0.322	1052	7.58	8.07	22.1	77.9
	Range	0.09-2.25	0.01-1.84	0.05-0.74	244-4713	6.7-8.1	2.9-27.8	0.8-53.3	47-99
	Number	16	16	16	14	9	8	15	15
Beef stacked pile	MAX	1.76	0.50	3.48	950	9.12	5.49	84.7	81.3
	MIN	0.34	0.10	0.10	3	5.17	1.05	18.7	15.3
	Mean	0.77	0.21	0.59	351	7.56	2.62	48.1	51.9
	Range	0.34-1.76	0.01-0.50	0.1-3.5	2.7-950	5.2-9.1	1.1-5.5	18.7-84.7	15.3-81.3
	Number	30	30	30	13	12	10	30	30
Dairy/Beef lagoon	MAX	0.11	0.02	0.22	557	9.2	14.2	0.92	99.9
	MIN	0.00	0.00	0.01	0.19	7.2	1.2	0.10	99.1
	Mean	0.021	0.005	0.054	120	8.3	3.9	0.28	99.72
	Range	0.00-0.11	0.00-0.02	0.01-0.22	0.19-557	7.2-9.2	1.2-14.2	0.1-0.92	99.1-99.9
	Number	8	8	8	8	7	7	8	8
Swine Concrete Pit	MAX	2.66	1.40	2.41	4684	7.8	24.3	70.7	99.6
	MIN	0.06	0.01	0.06	705	7.4	7.89	0.4	29.3
	Mean	0.583	0.201	0.404	2860	7.57	16.34	9.5	90.5
	Range	0.06-2.66	0.01-1.40	0.06-2.41	705-4684	7.4-7.8	7.9-24.3	0.4-70.7	29.3-99.6
	Number	17	17	17	13	7	7	17	17
Swine lagoon	MAX	0.76	0.74	0.33	2778	7.93	24.3	13.6	100.0
	MIN	0.00	0.00	0.00	6	7.2	0.5	0.0	86.4
	Mean	0.171	0.091	0.122	555	7.6	6.0	2.7	97.3
	Range	0.00-0.76	0.00-0.74	0.00-0.33	6 to 2778	7.2	0.5	0.0	86.4
	Number	20	20	20	13	8	8	20	20
Horse	MAX	0.76	0.23	0.82	2275	8.7	2.5	79.4	78.5
	MIN	0.19	0.05	0.19	495	7.1	2.1	21.5	20.7
	Mean	0.36	0.11	0.41	1282	8.2	2.3	45.3	54.7
	Range	0.19-0.76	0.05-0.23	0.19-0.82	495-2275	7.1-8.7	2.1-2.5	21.5-79.4	20.7-78.5
	Number	9.0	9.0	9.0	5.0	4.0	4.0	9.0	9.0

Submitting Samples to the Lab

Obtaining a representative manure sample from each storage area is critical to getting accurate test results. The basic guideline is to collect multiple samples, mix them together and make a composite sample.

Taking a representative sample: Obtain samples from at least 10 different places and/or depths to make the composite sample. In the case of poultry litter, sample to the bottom of the litter. If possible, agitate the liquids before collecting the sample.

Submitting dry samples: Submit one quart of dry manure in a Ziploc bag, squeeze excess air from the bag and seal it. Complete the manure testing sample information form and make sure to write your sample number or ID on the bag and mail it to the lab.

Submitting wet samples: Submit one pint of liquid manure in a plastic container. Do not fill the container. Make sure to leave at least one third free space and tighten the cap securely. Complete the manure testing sample information form and write your sample number or ID on the container with permanent ink and mail it to the lab.

Each sample submitted to the lab should be accompanied by a Sample Information Form and a check for the amount due payable to MU Soil Testing. When submitting a sample the Sample Information Form should be filled out accurately and completely. A Complete Manure Analysis Test package includes total nitrogen, phosphorus, potassium, ammonium nitrogen, pH and salt content (EC), and percent moisture costs \$40 per sample. A Basic Manure Analysis Test package includes Total nitrogen, phosphorus, and potassium and percent moisture costs

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\$22 per sample. The turn around for manure analysis is 3 to 5 working days. Additional Information on submitting samples to the lab, sample information forms and fees can be obtained by visiting the lab's website at: <http://soilplantlab.missouri.edu/soil/>

For additional information refer MU Guides:

EQ 215 Laboratory analysis of manure

G 9340, Sampling poultry litter for nutrient testing

G 9186: Calculating plant available nitrogen and residual nitrogen fertilizer value in manure.

Manjula Nathan
NathanM@missouri.edu
(573) 882-3250