Manure Analysis

FACT SHEET

Manure is an extremely valuable by-product of all livestock farming systems, and when properly managed, can supply large amounts of readily available essential plant nutrients.

In addition, most solid manures contain a good supply of organic matter and humus. This is of vital importance in the maintenance of a good soil structure. Manure management should include every effort to utilize as much of its value as possible. All manure management systems involve some degree of storage or treatment before land application. During this storage and handling, nitrogen is lost due to volatilization, leaching and denitrification.

The quantity, composition, and value of manure produced will vary according to species, weight, kind and amount of feed, and kind and amount of bedding. About 75% of the nitrogen, 80% of the phosphorus, and 85% of the potassium contained in animal feeds are returned as manure. Manure from well-fed animals is higher in nutrients and worth more than that of poorly fed ones. Also, it is noteworthy that the nutrients in liquid manure are more readily available to plants than the nutrients in the solid excrement. Tables 1 & 2 give the average composition of manure from various sources.

Nitrogen

As a general rule, incorporating manure into a cool, moist soil the same day of application provides the highest nitrogen retention rates. Animal manure actually provides two forms of nitrogen: organically bound nitrogen and inorganic nitrogen. Inorganic nitrogen is the form that is taken up by the plant root system and used for growth. The organically bound nitrogen in the soil breaks down over a period of time to form inorganic nitrogen.

The rate of conversion of organic nitrogen to inorganic nitrogen is called the mineralization or decay rate. Therefore, not all of the nitrogen that has been incorporated into the soil can be used by the plants during the first year after manure application. (Table 3)

Phosphorus & Potassium

About 70 percent of the total P applied in manure will become available in the year of application. Of the total potassium, 100 percent will be available the year of application.

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When to Sample Manure

Sample manure at the time of land application or as close to the time of application as possible. Sampling at the time of application will not provide manure recommendations that can be used to adjust the amount of manure applied. How-ever, the results can be used to adjust future manure applications and to adjust the amount of inorganic fertilizer applied. If you apply manure several times a year, sample when you apply the bulk of the manure.

References:
-A&L Laboratories: Manure Analysis Reference Guide, A&L Library
-A&L Agronomy Handbook, A&L Library

Table 1: Approximate Manure Nutrients Remaining at Time of Application

Species	System	Solids %	Lb/Ton				Lb/1000 gal	
			N	P_2O_5	K_2O	N	P_2O_5	K_2O
Dairy Cattle	Daily Spread	15	8	5	10	–	–	–
	Anaerobic Pit	8	–	–	–	24	18	29
	Earthen Storage	10	–	–	–	32	14	28
	Anaerobic Lagoon	1	–	–	–	4	5	5
	Above Ground Storage	12	–	–	–	46	18	40
	Covered Stack	18	10	9	12	–	–	–
Swine	Anaerobic Pit	4	–	–	–	36	27	19
	Anaerobic Lagoon	1	–	–	–	4	2	4
Beef	Open Feedlot	15	10	7	10	–	–	–
Poultry	Liquid Pit	13	–	–	–	80	37	96
	Dry Pit (dry)	85	100	70	40	–	–	–
	Dry Pit (Crumbly)	70	60	55	30	–	–	–
	Dry Pit (moist)	50	40	40	20	–	–	–
	Dry Pit (fresh)	25	30	20	10	–	–	–
	Compost	54	44	66	48	–	–	–
Sheep	Dry Pit	25	23	8	20	–	–	–
Horse	Dry Pit	20	12	5	9	–	–	–
Composted Poultry Materials	Dry Pit	54	44	66	48	–	–	–

**Ref: A&L Laboratories: Manure Analysis Reference Guide*

Table 2: Nutrients in Liquid Livestock Manure

	S	Mg	Ca	Fe	Mn	Cu	Zn	B
Dairy	1 – 6	3 – 9	10 – 25	.4 – 2.0	.05 – .20	.02 – .05	.10 – .30	.05 – .15
Beef	2 – 8	3 – 9	5 – 25	.5 – 1.5	.05 – .20	.02 – .05	.10 – .30	.05 – .20
Swine	2 – 8	3 – 8	10 – 40	1.0 – 2.5	.10 – .30	.05 – .20	.2 – .5	.05 – .30

* Assumed 1 gallon weighs 9 pounds
***Ref: A&L Laboratories: Manure Analysis Reference Guide*

Table 3: Manure Nitrogen Availability for Various Storage, Treatment, Application and Incorporation Methods

Category	Treatment Method	Species	N Availability Factor		
			1st yr	2nd	3rd
1	-Fresh manure; incorporated same day	Cattle	0.60	0.13	0.08
		Poultry	0.80	0.06	0.02
		Swine	0.70	0.10	0.04
2	-Fresh manure; incorporated 1-4 days -Fresh manure; flushed; liquid spread -Liquid holding tank; injection	Cattle	0.50	0.13	0.08
		Poultry	0.70	0.06	0.02
		Swine	0.60	0.10	0.04
3	-Fresh manure; incorporated 5 or more days later	Cattle	0.42	0.13	0.08
		Poultry	0.60	0.06	0.02
		Swine	0.50	0.10	0.04
4	-Fresh manure; flush; solids separation; liquid spread -Liquid-holding tank; incorporated 1-4 days -Solid manure stack; incorporated same day	Cattle	0.46	0.10	0.06
		Poultry	0.63	0.05	0.02
		Swine	0.55	0.08	0.04
5	-Liquid-holding tank; incorporated 5 or more days -Solid manure stack; incorporated 1-4 days	Cattle	0.37	0.10	0.06
		Poultry	0.54	0.04	0.01
		Swine	0.46	0.08	0.03
6	-Solid manure stack; incorporated 5 or more days -Earth-holding pond; liquid spread -Deep litter, poultry	Cattle	0.27	0.11	0.06
		Poultry	0.44	0.04	0.01
		Swine	0.36	0.08	0.03
7	-Open-lot storage; solid spread	Cattle	0.18	0.11	0.06
		Poultry	0.34	0.04	0.01
		Swine	0.26	0.08	0.03

**Ref.* *"Using Animal Manure as Fertilizer," Clemson University-Circular 578*

**Multiply nitrogen content of manure by N availability factor to obtain approximate available nitrogen.