Nutrient Concentrations in Manure Storage Facilities

The concentration of nutrients in manure storage facilities is important for planning land application activities. Nutrient concentration is usually the critical factor in determining the amount of manure to be spread per acre of land. Manure systems similar in type and management may have characteristically similar concentrations of manure nutrients. However, manure nutrient concentrations can be highly variable, even among similar systems, so laboratory analysis of the manure should always be performed to establish a trend or baseline of manure nutrient concentration.

Nutrients are usually more concentrated in solid manure.

Solid manure systems

Examples of solid manure systems include poultry litter, separated manure solids, manure/bedding mixtures in hoop structures for swine, and mortality compost. Table 21-5 gives ranges of values that might be expected for nutrient concentrations in several types of solid manure.

Table 21-5. Nutrient concentrations in various types of solid manure.

	Nutrient Concentration, lbs/ton			
Manure Type	**Total Kjeldahl N**	**Ammonia N**	**P_2O_5**	**K_2O**
Poultry Litter[1]	40-80	10-20	30-60	30-50
Separated dairy Solids[2] 23% DM	5.8-7.4	0.3-0.7	1.8-2.4	2.4-3.6
Swine hoop structure[3]	12-15	— —	— —	— —
Mortality compost[4]	15-25	3-6	1-3	4-8
Beef feedlot, dirt lot	21-24	7	14-36	4-23

[1] Range of values from NRCS Agricultural Waste Management Field Handbook 1996; MWPS-18, Livestock Waste Facilities Handbook 1993; University (U) of Missouri (MO) studies.
[2] Performance of screen separator at U of MO dairy farm.
[3] Studies from Iowa State U Rhodes Research Farm using cornstalk bedding.
[4] Swine mortality compost, U of MO.

Slurry manure systems

Typical slurry manure systems include underfloor pits and outdoor storage tanks or basins to which manure is scraped, flushed, or drained by gravity (pull-plug). Slurry manure usually contains 5% to 10% dry matter and is usually handled with manure pumps and tankwagons. However, continuous pumping systems using "drag-hose injection" are becoming more popular for managing slurry manure. Slurry storage facilities should always be agitated before emptying because considerable settling and stratification of solids typically occurs in these structures. As with other types of manure, slurry manure can be quite variable in nutrient content, and a laboratory analysis should always be conducted to determine actual nutrient levels. Table 21-6 shows typical nutrient levels for different slurry manure systems.

Nutrients in slurry manure are less concentrated due to higher water content.

Table 21-6. Nutrient concentrations in various types of slurry manure.

Slurry Type	Nutrient Concentration, lbs/1,000 gallons			
	Total Kjeldahl N	Ammonia N	P_2O_5	K_2O
Swine	30-45	20-30	20-30	20-30
Dairy	25-35	10-15	15-20	20-30
Beef	30-40	10-25	15-30	25-35
Poultry	60-80	15-60	35-45	30-95

Source: Range of values from MWPS-18, Livestock Waste Facilities Handbook 1993; NRCS Agricultural Waste Management Field Handbook 1996; Ohio Livestock Manure and Wastewater Management Guide 1992; and studies at the University of Missouri.

Liquid manure systems

Liquid manure systems (less than 5% solids) may be designed or function as lagoon systems that provide a degree of manure treatment. Climatic effects such as rainfall and runoff from open lots can significantly impact the nutrient concentration of lagoons. Additionally, some nutrients are concentrated in the sludge layer and may not be available if the lagoon is not agitated. Lagoon effluent can be highly variable in nutrient content and should be analyzed to determine actual nutrient concentrations. Table 21-7 shows the ranges of values for nutrient concentration in lagoon effluent.

Table 21-7. Nutrient content in various types of lagoon systems.

Manure Type	Nutrient Concentration, lbs/acre-inch (lbs/1,000 gallons)			
	Total Kjeldahl N	Ammonia N	P_2O_5	K_2O
Swine lagoon	100-300 (3.7-11)	85-250 (3.1-9.2)	40-80 (1.5-2.9)	100-300 (3.7-11)
Dairy lagoon	80-150 (2.9-5.5)	45-80 (1.7-2.9)	50-100 (1.8-3.7)	100-200(3.7-7.4)
Beef lagoon	40-120 (1.5-4.4)	40-60 (1.5-2.2)	80-250 (2.9-9.2)	100-250(3.7-9.2)
Poultry lagoon	80-170 (2.9-6.3)	60-120 (2.2-4.4)	50-150 (1.8-5.5)	400-500 (15-18)
Beef feedlot, runoff holding pond	45 (1.67)	41 (1.50)	— —	244 (9)

Source: Range of values from MWPS-18, Livestock Waste Facilities Handbook 1993; NRCS Agricultural Waste Management Field Handbook 1996; Ohio Livestock Manure and Wastewater Management Guide 1992; and studies at the University of Missouri.