

Nutrient & Manure Management Tables

Table 1. Annual Manure Production and Nutrient Excretion from Livestock

Animal Type	Manure Production per 1,000 lb. of Animal Weight		Excreted Nutrients in Manure per 1,000 lb. of Animal Weight		
	Solid tons/year	Liquid gal./year	N lb./year	P2O5 lb./year	K2O lb./year
BEEF CATTLE					
Calf	19.5	4,591	162	73	130
Finishing	9.0	2,141	131	39	83
Cow	16.8	3,982	128	66	106
DAIRY CATTLE					
Calf	14.6	3,358	146	24	122
Heifer	11.0	2,536	112	39	112
Lactating	20.3	4,876	263	135	146
Dry Cow	9.3	2,241	110	40	88
Veal	4.8	1,153	44	29	73
SWINE					
Nursery	13.9	3,358	292	146	146
Finishing	9.0	2,166	219	73	97
Gestating Sow	4.1	998	61	37	49
Lactating Sow	8.5	2,025	165	107	127
Boar	3.8	900	49	37	37
POULTRY					
Layer	9.1	2,068	316	97	146
Broiler	17.3	4,198	383	256	183
Turkey (F)	8.6	2,044	285	186	124
Turkey (M)	6.8	1,606	203	135	88
Duck	20.1	4,836	392	310	237
HORSE					
Pleasure	9.9	2,394	66	22	22
"Racer"	10.1	2,446	110	55	84
SHEEP					
Feeder	7.5	1,825	146	73	146

Adapted From: Manure Characteristics, MWPS-18 Section 1, Midwest Plan Service, 2004 Second Edition

Table 2. Nitrogen Losses From Animal Manure as Affected by Method of Handling and Storage

Manure Storage and Handling method	Manure Type	% Storage Nitrogen Loss
Daily scrape and haul	Solid (tons)	25
Manure pack	Solid (tons)	30
Open lot	Solid (tons)	50
Litter	Solid (tons)	35
Above ground tank	Liquid (gallons)	20
Below ground covered pit	Liquid (gallons)	20
Below ground open pit	Liquid (gallons)	25
Under-floor dry storage	Solid (tons)	25
Under-floor liquid storage	Liquid (gallons)	20
Earthen storage	Liquid (gallons)	30
Lagoon	Liquid (gallons)	75

Adapted From: Animal Manure as a Plant Nutrient Source, ID-101, Cooperative Extension Service, Purdue University, 2001

Table 3. Nutrient Content of Stored Manure

Animal Type	Liquid Manure (lb./1000 gallons)			Solid Manure (lb./Tons)		
	N	P2O5	K2O	N	P2O5	K2O
BEEF						
Cows	20	16	24	7	4	7
Finishing Cattle	29	18	26	11	7	11
DAIRY						
Cows	31	15	19	10	3	6
Heifers	32	14	28	10	3	7
SWINE						
Farrowing	15	12	11	14	6	4
Nursery	25	19	22	13	8	4
Gestation	25	25	24	9	7	5
Finishing	58	44	40	16	9	5
POULTRY						
Broilers	63	40	29	46	53	36
Layers	57	52	33	34	51	26
Tom Turkeys	53	40	29	40	50	30
Hen Turkeys	60	38	32	40	50	30
HORSE						
				14	4	14
SHEEP						
				18	11	26

Manure Management in Minnesota, FO-3553-C, University of Minnesota Extension, 2012 Manure Characteristics, MWPS-18 Section 1, Midwest Plan Service, 2004

Table 4. Nitrogen Availability and Loss as Affected by Method of Manure Application and Animal Species

Year Available (1)	% of Total Nitrogen Available Per Year				
	Broadcast Incorporation Time (2)			Injection	
	> 96 hrs	12-96 hrs.	<12 hrs.	Sweep	Knife
BEEF					
Year 1	25	45	60	60	50
Year 2	25	25	25	25	25
Lost	40	20	5	5	10
DAIRY					
Year 1	20	40	55	55	50
Year 2	25	25	25	25	25
Lost	40	20	10	5	10
SWINE					
Year 1	35	55	75	80	70
Year 2	15	15	15	15	15
Lost	50	30	10	5	15
POULTRY					
Year 1	45	55	70	NA	NA
Year 2	25	25	25	NA	NA
Lost	30	20	5		

From: Manure Management in Minnesota, FO-3553-C, University of Minnesota Extension Service, 2007

(1) Third year available N is not listed but can be computed by adding 1st and 2nd year and lost percentages and subtracting this sum from 100.

(2) Timing categories refer to the length of time between manure application and incorporation.

Calibrating Your Manure Spreader

- Determine manure weight (solid manure) or manure volume (liquid manure) per spreader load (Use measured manure weight or 90% of the manufacturer's listed volume for liquid).
- Calculate rate based on loads applied per field of known size **OR** calculate rate based on acres covered per load ($Length \times Width \text{ of Spread (ft.}^2\text{)}/43,560$).



Table 5. Average Nutrient Removal Rates for Crops in the Northcentral Region

Crop	Crop Nutrient Removal (lb. per unit)			
	Yield Units	N	P2O5	K2O
Alfalfa	ton (air dry)	51	12	49
Alsike clover	ton (air dry)	41	11	54
Barley (grain)	bushel	0.99	0.4	0.32
Barley (grain & straw)	bushel	1.39	0.56	1.52
Birdsfoot trefoil	ton (air dry)	45	11	42
Canola	bushel	1.9	1.2	2
Corn (grain)	bushel	0.9	0.38	0.27
Corn silage	ton (as fed)	9.7	3.1	7.3
Beans, dry	bushel	3	0.79	0.92
Bromegrass	ton	32	10	46
Orchardgrass	ton	36	13	54
Oats (grain)	bushel	0.77	0.28	0.19
Oats (straw)	ton	12	6.3	37
Potatoes (tuber)	cwt	0.32	0.12	0.55
Red clover	ton	45	12	42
Rye (grain)	bushel	1.4	0.46	0.31
Rye (straw)	ton	12	3	22
Soybeans	bushel	3.8	0.84	1.3
Sugar beets	ton	3.7	2.2	7.3
Sunflowers	cwt	2.7	0.97	0.9
Wheat (grain)	bushel	1.5	0.6	0.34
Wheat (straw)	ton	14	3.3	24

Source: International Plant Nutrition Institute (IPNI) Sept. 2005 <http://nanc.ipni.net/articles/NANCO005-EN>

Table 8. Legume Nitrogen Credits

For Corn, Wheat, and Barley grown the 1st and 2nd year after a legume crop

Legume (Previous Crop)	Corn		Wheat & Barley	
	1st year	2nd year	1st year	2nd year
Soybeans	40	0	20	0
Edible beans	20	0	10	0
Field peas	20	0	10	0
Red Clover	75	35	35	20
Harvested sweet clover	20	0	10	0
Harvested alfalfa or nonharvested sweet clover (plants/ft 2)				
4 or more	150	75	75	35
2-3	100	50	50	25
1 or less	40	0	0	0

Table 6. Common Fertilizer Analyses

Example to calculate fertilizer price per pound:
 Urea (46-0-0) = \$600/ton
 (2000 lb. X .46% N) = 920 lb. N/ton
 \$600 / 920 lb. = \$0.65/lb.

Fertilizer	Analysis
N	
Anhydrous Ammonia	82-0-0
Ammonium Nitrate	34-0-0
Urea	46-0-0
UAN Solution (Urea Ammonium Nitrate)	28 to 32-0-0
Ammonium Sulfate	21-0-0-24(S)
P	
Triple Superphosphate (TSP)	0-44 to 0-46
Diammonium Phosphate (DAP)	18-46-0
Monoammonium Phosphate (MAP)	11-52-0
Ammonium Polyphosphate Liquid (APP)	10-34-0
Ammonium Polyphosphate Dry (APP)	15-62-0
K	
Potassium Chloride (Muriate of Potash)	0-0-60
Potassium Sulfate	0-0-50-18(S)
Potassium-Magnesium Sulfate (Sul-fo-mag)	0-0-22-22(S)-11(Mg)
Potassium Nitrate	13-0-44

Table 7. Nitrogen Rate Guidelines for Corn (When Using a Manure Source)

Previous Crop ¹	Soil / Field Productivity Potential	
	Highly Productive Soils	Medium Productive Soils ²
	----- lb. N/A -----	
CORN	130 - 180	130
SOYBEAN	100 - 140	100

¹For previous crops other than corn or soybeans use the corn following corn rate guideline and subtract any previous crop N credits in Table 8.

²Soil and environmental conditions that limit crop production such as erosion, poor soil drainage, restriction to root growth, short growing season, and marginal growing season rainfall, among others, would qualify a site as having medium productivity potential.

Table 9. Nitrogen Sources Per Pound Conversions

Anhydrous Ammonia (82-0-0)		Urea (46-0-0)		UAN (28-0-0)	
Price per ton	N Price per lb	Price per ton	N Price per lb	Price per ton	N Price per lb
400	\$0.25	350	\$0.38	200	\$0.36
450	\$0.28	385	\$0.42	225	\$0.40
500	\$0.30	420	\$0.46	250	\$0.45
550	\$0.34	455	\$0.49	275	\$0.49
600	\$0.37	490	\$0.53	300	\$0.54
650	\$0.40	525	\$0.57	325	\$0.58
700	\$0.43	560	\$0.61	350	\$0.63
750	\$0.46	595	\$0.65	375	\$0.67
800	\$0.49	630	\$0.68	400	\$0.71
850	\$0.52	665	\$0.72	425	\$0.76
900	\$0.55	700	\$0.76	450	\$0.80
950	\$0.58	735	\$0.80	475	\$0.85
1,000	\$0.61	770	\$0.84	500	\$0.89
1,050	\$0.64	805	\$0.88	525	\$0.94
1,100	\$0.67	840	\$0.91	550	\$0.98
1,150	\$0.70	875	\$0.95	600	\$1.07
1,200	\$0.73	910	\$0.99	650	\$1.16

Table 10. Conversion Factors

1 acre = 43,560 sq. ft	
1 cubic ft. = 7.48 gallons	
1 gallon of water = 8.33 lb.	
1 ton = 2000 lb.	
SOIL TESTING CONVERSIONS	
Plow Layer (6-7 in) = ppm X 2 = lb./acre	
Top 12 inches = ppm X 4 = lb./acre	
Top 24 inches = ppm X 8 = lb./acre	
P2O5 X 0.44 = P	
P X 2.29 = P2O5	
K2O X 0.83 = K	
K X 1.20 = K2O	
FERTILIZER CONVERSIONS	
1 gal. of UAN (28%) = 10.66 lb.	
1 gal. (10-34-0) = 11.65 lb.	
1 gal. (7-21-7) = 11.0 lb.	
1 gal. (9-18-9) = 11.11 lb.	

Manure Management Related Websites

- Certified Manure Testing Laboratories: <http://www2.mda.state.mn.us/webapp/lis/manurelabs.jsp>
- University of Minnesota Manure Management: <http://www.manure.umn.edu/>
- Minnesota Department of Ag Manure Management: <http://www.mda.state.mn.us/protecting/conservation/practices/manuregmt.aspx>
- Minnesota NRCS Manure Management: <http://www.mn.nrcs.usda.gov/technical/ecs/nutrient/manure/manure.htm>
- Nitrogen Best Management Practices (BMPs): <http://www.mda.state.mn.us/nitrogenbmps>
- Nitrogen Rate Calculator: <http://extension.agron.iastate.edu/soilfertility/nrate.aspx>
- Minnesota Pollution Control Agency: <http://www.pca.state.mn.us/index.php/topics/feedlots/feedlot-nutrient-and-manure-management.html?menuid=&redirect=1>

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