

Nutrient/Manure Management Information Tables

Table 1. Annual manure production and nutrient excretion from livestock.

| Animal Type | Manure Production per 1,000 lbs. of Animal Weight | | Excreted Nutrients in Manure per 1,000 lbs. of Animal Weight | | |
|-----------------------|---|----------------|--|-------------------------------|------------------|
| | Solid | Liquid | N | P ₂ O ₅ | K ₂ O |
| | (tons/year) | (gallons/year) | (lbs per year) | | |
| Beef cattle | | | | | |
| Calf | 19.5 | 4591 | 162 | 73 | 130 |
| Finishing | 9.0 | 2141 | 131 | 39 | 83 |
| Cow | 16.8 | 3982 | 128 | 66 | 106 |
| Dairy cattle | | | | | |
| Calf | 14.6 | 3358 | 146 | 24 | 122 |
| Heifer | 11.0 | 2536 | 112 | 39 | 112 |
| Lactating | 20.3 | 4876 | 263 | 135 | 146 |
| Dry cow | 9.3 | 2241 | 110 | 40 | 88 |
| Veal | 4.8 | 1153 | 44 | 29 | 73 |
| Swine | | | | | |
| Nursery | 13.9 | 3358 | 292 | 146 | 146 |
| Finishing | 9.0 | 2166 | 219 | 73 | 97 |
| Gestating sow | 4.1 | 998 | 61 | 37 | 49 |
| Lactating sow | 8.5 | 2025 | 165 | 107 | 127 |
| Boar | 3.8 | 900 | 49 | 37 | 37 |
| Poultry | | | | | |
| Layer | 9.1 | 2068 | 316 | 97 | 146 |
| Broiler | 17.3 | 4198 | 383 | 256 | 183 |
| Turkey (F) | 8.6 | 2044 | 285 | 186 | 124 |
| Turkey (M) | 6.8 | 1606 | 203 | 135 | 88 |
| Duck | 20.1 | 4836 | 392 | 310 | 237 |
| Horse | | | | | |
| Pleasure | 9.9 | 2394 | 66 | 22 | 22 |
| "Racer" | 10.1 | 2446 | 110 | 55 | 84 |
| Sheep (feeder) | 7.5 | 1825 | 146 | 73 | 146 |

Adapted from: *Manure Characteristics*, MWPS-18 Section 1, MidWest Plan Service, 2004 Second Edition

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

OR

 Calculate rate based on acres covered per load

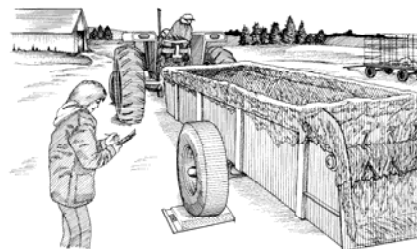


Table 2. Nitrogen losses from animal manure as affected by method of handling and storage.

| 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. Estimated nutrient content of liquid and solid manure.

| Animal Type | Liquid Manure | | | Solid Manure | | |
|-----------------|---------------------------|-------------------------------|------------------|----------------------|-------------------------------|------------------|
| | N | P ₂ O ₅ | K ₂ O | N | P ₂ O ₅ | K ₂ O |
| | --- lbs/1,000 gallons --- | | | ----- lbs./ton ----- | | |
| Beef | | | | | | |
| Feeder cattle | 29 | 18 | 26 | 14 | 9 | 14 |
| Cow | 20 | 16 | 24 | 11 | 7 | 9 |
| Dairy | | | | | | |
| Heifer | 32 | 14 | 28 | 13 | 12 | 19 |
| Cow | 25 | 15 | 27 | 11 | 7 | 9 |
| Swine | | | | | | |
| Sow and litter | 27 | 27 | 15 | 14 | 6 | 4 |
| Nursery | 34 | 25 | 18 | 13 | 8 | 4 |
| Grow and finish | 53 | 39 | 29 | 22 | 22 | 17 |
| Gestation | 40 | 42 | 18 | 22 | 27 | 14 |
| Poultry | | | | | | |
| Layers | 57 | 52 | 33 | 34 | 51 | 26 |
| Broilers | 63 | 40 | 29 | 46 | 53 | 36 |
| Turkey | 53 | 40 | 29 | 44 | 63 | 34 |
| Horse | | | | 14 | 4 | 14 |
| Sheep | | | | 18 | 11 | 26 |

Sources: *Manure Management in Minnesota*, FO-3553-C, University of Minnesota Extension Service, 1999
Manure Characteristics, MWPS-18 Section 1, MidWest Plan Service, 2000
Livestock Waste Facilities Handbook, MWPS-18, MidWest Plan Service, 1985

Table 4. Nitrogen availability and loss as affected by method of manure application and animal species.

| Year Available ¹ | Broadcast Incorporation Timing ² | | | Injection | |
|--|---|---------------|-----------|-----------|-------|
| | > 96 hrs | 12 to 96 hrs. | < 12 hrs. | Sweep | Knife |
| % of Total Nitrogen Available Per Year | | | | | |
| 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 | | |

Adapted from: *Manure Planning and Record Keeping Guide*, BU-6957, University of Minnesota Extension Service, 2001

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.

Conversion Factors

1 acre = 43,560 ft²
 1 cubic ft. = 7.48 gallons
 1 gal. of water = 8.33 lbs.

Soil Testing Conversions

Plow layer (6-7 inches) = ppm X 2 = lbs./acre
 Top 12 inches = ppm X 4 = lbs./acre
 Top 24 inches = ppm X 8 = lbs./acre
 $P_2O_5 \times 0.44 = P$
 $P \times 2.29 = P_2O_5$
 $K_2O \times 0.83 = K$
 $K \times 1.20 = K_2O$

Fertilizer Conversions

1 gal. of UAN (28%) = 10.66 lbs.
 1 gal. (10-34-0) = 11.65 lbs.
 1 gal. (7-21-7) = 11.0 lbs.
 1 gal. (9-18-9) = 11.11 lbs.

Table 5. Nutrient removal in the harvested portion of the crop.

| Crop | Yield Units | Crop Nutrient Removal (lbs. per unit) | | |
|--------------------------|---------------|---------------------------------------|-------------------------------|------------------|
| | | N | P ₂ O ₅ | K ₂ O |
| Alfalfa | ton (air dry) | 50 | 11 | 46 |
| Alsike clover | ton (air dry) | 41 | 11 | 54 |
| Barley (grain) | bushel | | 0.41 | 0.28 |
| Barley (grain and straw) | bushel | | 0.55 | 1.67 |
| Birdsfoot trefoil | ton (air dry) | 45 | 9.3 | 41 |
| Canola | cwt. | | 1.3 | 1.1 |
| Corn (grain) | bushel | | 0.34 | 0.19 |
| Corn silage | ton (as fed) | | 3.8 | 7.4 |
| Edible beans | pound | | 0.01 | 0.03 |
| Grass hay or pasture | ton (air dry) | 27 | 8.9 | 31 |
| Grass/legume | ton (air dry) | 44 | 11 | 41 |
| Oats (grain) | bushel | | 0.25 | 0.16 |
| Oats (grain and straw) | bushel | | 0.32 | 1.31 |
| Peas | pound | | 0.01 | 0.01 |
| Potatoes | cwt. | | 0.14 | 0.56 |
| Red clover | ton (air dry) | 45 | 11 | 41 |
| Rye (grain) | bushel | | 0.44 | 0.31 |
| Rye (grain and straw) | bushel | | 0.59 | 1.25 |
| Soybeans | bushel | 3.5 | 0.82 | 1.0 |
| Sugar beets | ton | | 2.2 | 7.3 |
| Sunflowers | pound | | 0.01 | 0.01 |
| Sweet corn | ton | | 11 | 14 |
| Wheat (grain) | bushel | | 0.53 | 0.3 |
| Wheat (grain and straw) | bushel | | 0.64 | 1.5 |

Source: *Plants Database*, USDA (<http://npk.nrcs.usda.gov>)

Common Fertilizer Analyses

| <u>FERTILIZER</u> | <u>ANALYSIS</u> |
|------------------------------|-------------------|
| 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 46-0 |
| 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) | 0-0-22-22S-11(Mg) |
| Potassium nitrate | 13-0-44 |

