

# Useful Nutrient Management Data

## Crop Nutrient Removal

CROP	NUTRIENT (lbs. per unit of indicated yield)				
	N	P <sub>2</sub> O <sub>5</sub>	P	K <sub>2</sub> O	K
<b>Corn<sup>1</sup></b>					
Grain, 100 bu.....	90	36	16	26	22
Stover, 1 ton (dry).....	22	8	4	32	26
<b>Corn silage<sup>2</sup>, 10 tons</b> .....	83	36	16	83	69
<b>Sorghum silage, 1 ton</b> .....	40	15	7	58	48
<b>Soybeans<sup>1</sup>, Grain, 50 bu.</b> .....	188	44	19	69	58
<b>Beans<sup>1</sup>, dry, Grain, 50 bu.</b> .....	125	42	18	42	35
<b>Wheat<sup>1</sup></b>					
Grain, 50 bu.....	63	31	14	19	16
Straw, 1 ton.....	13	3	1	40	19
<b>Barley<sup>1</sup></b>					
Grain, 50 bu.....	44	19	9	13	11
Straw, 1 ton.....	15	5	2	30	25
<b>Oats<sup>1</sup></b>					
Grain, 100 bu.....	62	25	11	19	16
Straw, 1 ton.....	12	8	3	40	33
<b>Sunflower<sup>2</sup>, Grain, 10 cwt.</b> .....	36	17	7.5	11	9.1
<b>Sugarbeets<sup>2</sup>, Beet, 10 tons</b> .....	42	5	2.2	83	69
<b>Alfalfa hay<sup>3</sup>, 1 ton</b> .....	45	10	4	45	37
<b>Timothy hay<sup>3</sup>, 1 ton</b> .....	24	10	4	38	32
<b>Potatoes, Tubers, 500 cwt.</b> .....	175	75	33	280	232

<sup>1</sup> Grain crops cannot be compared on a bushel basis because the weight per bushel varies among crops.

<sup>2</sup> Numbers taken from Potash and Phosphate Institute publications.

<sup>3</sup> Composition, especially nitrogen, varies with maturity of the crop.

All other numbers taken from the "Modern Corn Publication", S. R. Alsdreich et al., 1986.

## Common Fertilizer Analyses

FERTILIZER	ANALYSIS	CHEMICAL FORMULA
<b>N</b>		
Anhydrous ammonia.....	82-0-0	NH <sub>3</sub>
Ammonium nitrate.....	34-0-0	NH <sub>4</sub> NO <sub>3</sub>
Urea.....	46-0-0	(NH <sub>2</sub> ) <sub>2</sub> CO
UAN solution (Urea ammonium nitrate).....	28 to 32-0-0	NH <sub>4</sub> NO <sub>3</sub> plus (NH <sub>2</sub> ) <sub>2</sub> CO in water
Aqua ammonia.....	20-0-0	NH <sub>3</sub> in water
Ammonium sulfate.....	21-0-0-24(S)	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>
<b>P</b>		
Triple superphosphate (TSP).....	0-44 to 46-0	Ca(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub>
Diammonium phosphatate (DAP).....	18-46-0	(NH <sub>4</sub> ) <sub>2</sub> HPO <sub>4</sub>
Monoammonium phosphate MAP).....	11-48-0	NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub>
Ammonium polyphosphate liquid (APP).....	10-34-0	NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> plus (NH <sub>4</sub> ) <sub>3</sub> HP <sub>2</sub> O <sub>7</sub>
Ammonium polyphosphate dry (APP).....	15-62-0	Same as liquid
<b>K</b>		
Potassium chloride (Muriate of potash).....	0-0-60	KCl
Potassium sulfate.....	0-0-50-18(S)	K <sub>2</sub> SO <sub>4</sub>
Potassium-magnesium sulfate (Sul-fo-mag).....	0-0-22-22(S)-11(Mg)	K <sub>2</sub> SO <sub>4</sub> •2MgSO <sub>4</sub>
Potassium nitrate.....	13-0-44	KNO <sub>3</sub>

## Per Animal Daily Manure Production And Pounds of Nutrients<sup>1</sup>

	LBS. GAL. N P <sub>2</sub> O <sub>5</sub> K <sub>2</sub> O				
	----- Lbs. -----				
Beef (1,000 lbs.).....	60	7.5	0.34	0.25	0.29
Dairy (1,400 lbs.).....	115	13.9	0.57	0.24	0.46
Swine (200 lbs.).....	13.1	1.5	0.09	0.07	0.07
Turkey.....	0.7		0.009	0.008	0.00
Chicken (layer).....	0.2		0.003	0.003	0.00

<sup>1</sup> Adjust proportionately for different animal weights. Does not account for storage or application losses.

Numbers taken from Minnesota Extension Service publications.

## Nutrient Analysis of Beef, Dairy, Swine and Poultry Manure

DAIRY	Total N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
<i>Solid:</i> ----- Lbs. / Ton -----			
Cows.....	11	7	9
Heifers.....	13	12	19
<i>Liquid:</i> ----- Lbs. / 1,000 Gals. -----			
Anaerobic storage.....	25	15	27
<b>BEEF</b>			
<i>Solid:</i> ----- Lbs. / Ton -----			
Cows.....	15	10	9
Steers.....	14	9	14
<b>SWINE</b>			
<i>Solid:</i> ----- Lbs. / Ton -----			
Gestation.....	22	27	14
Finishing.....	22	22	17
<i>Liquid:</i> ----- Lbs. / 1,000 Gals. -----			
Farrowing.....	27	27	15
Nursery.....	34	25	18
Gestation.....	40	42	18
Finishing.....	53	39	29

## POULTRY

	----- Lbs. / Ton -----		
Turkeys.....	44	63	34

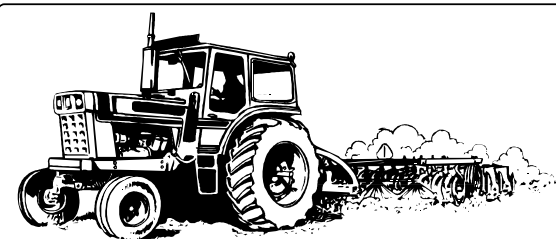
Numbers taken from Minnesota Extension Service publications.

## Manure Nitrogen Availability and Loss as Affected by Method of Application and Animal

	Species				
	Broadcast - Incorporated <sup>1</sup>		Injection		
	----- % Total N -----				
	None	0-1/2 day	1/2-4 days	Sweep	Knife
<b>Dairy</b>					
Av. Yr. 1.....	20	55	40	55	50
Av. Yr. 2.....	40	35	40	40	40
Lost <sup>2</sup> .....	40	10	20	5	10
<b>Beef</b>					
Av. Yr. 1.....	25	60	45	60	50
Av. Yr. 2.....	35	35	35	35	40
Lost.....	40	5	20	5	10
<b>Swine</b>					
Av. Yr. 1.....	35	75	55	80	70
Av. Yr. 2.....	15	15	15	15	15
Lost.....	50	10	30	5	15
<b>Poultry</b>					
Av. Yr. 1.....	45	70	55	NA	NA
Av. Yr. 2.....	25	25	25		
Lost.....	30	5	20		

<sup>1</sup> The categories refer to the length of time between manure application and incorporation.

<sup>2</sup> Lost refers to estimated volatilization and denitrification processes.



**Nitrogen Credits from Legumes**

for Corn, Wheat and Barley  
grown the first and second years after legume crop

LEGUME	CORN		WHEAT & BARLEY	
	1st Year	2nd Year	1st Year	2nd Year
Soybeans	40	0	20	0
Edible beans				
field peas,				
harvested				
sweet clover	20	0	10	0
Harvested alfalfa <sup>1</sup>				
or nonharvested				
sweet clover				
(plants / ft. <sup>2</sup> ):				
• 4 or more	150	75	75	35
• 2-3 <sup>2</sup>	75	50	50	25
• 1 or less	40	0	0	0
Red clover	75	35	35	20

<sup>1</sup>For wheat and barley, where the 3rd and 4th cutting of legume was not harvested, add 20 lbs. Nitrogen to given figures.

<sup>2</sup>Values given also apply to alsike clover and birdsfoot trefoil. For other crops, see Minnesota Extension Services publications.

Numbers taken from Minnesota Extension service publications.

**Weights of Crops Per Bushel**

CROP	LBS./BU.
Corn	56
Sorghum	56
Soybeans	60
Wheat	60
Barley	48
Oats	32
Rye	56
Sudangrass	40
Potatoes	60
Sweet Potatoes	55
Sunflower	25

**Fertilizer Conversion Factors**

P<sub>2</sub>O<sub>5</sub> X 0.44 = P  
P X 2.29 = P<sub>2</sub>O<sub>5</sub>  
K<sub>2</sub>O X 0.83 = K  
K X 1.20 = K<sub>2</sub>O  
1 gal. water = 8.33 lbs.  
1 gal. UAN = 10.6 lbs.

**Length/Weight Conversion Factors**

**LENGTH:**

1 inch = 2.54 cm  
1 yard = 0.915 meters  
1 mile = 5,280 feet = 1,610.7 meters = 1.61 km  
1 meter = 100 cm = 1,000 mm = 0.001 km  
1 chain = 66 feet = 100 links = 20.1 meters  
= 4 rods

**WEIGHT:**

1 pound = 454 gm = 0.454 Kg = 16 ounces  
1 ton (short) = 2,000 pounds  
1 ton (long) = 2,240 pounds

**Soil Testing Information**

SOIL TESTS (All Crops)

P Test	V. Low	Low	Med.	High	V. High
	Rating (ppm P)				
Bray	0-5	6-10	11-15	16-20	21+
Olsen	0-3	4-7	8-11	12-15	16+
K Test	Rating (ppm K)				
	0-40	41-80	81-120	121-160	161+

**AMOUNTS OF P<sub>2</sub>O<sub>5</sub> AND K<sub>2</sub>O TO APPLY<sup>1</sup>**

**Corn**  
Amount of P<sub>2</sub>O<sub>5</sub> = [0.7 - 0.035 (Bray P ppm)] (yield goal); or  
[0.7 - 0.044 (Olsen P ppm)] (yield goal)  
None if soil is > 25 ppm (Bray) or > 20 ppm (Olsen)  
Amount of K<sub>2</sub>O = [1.166 - 0.0073 (K Test, ppm)] (yield goal)  
None of soil is ≥ 175 ppm for K Test

**Wheat**  
Amount of P<sub>2</sub>O<sub>5</sub> = [1.071 - 0.54 (Bray P ppm)] (yield goal); or  
[1.071 - 0.067 (Olsen P ppm)] (yield goal)  
None of soil is > 21 ppm (Bray) or > 16 ppm (Olsen)  
Amount of K<sub>2</sub>O = [2.71 - 0.017 (K Test, ppm)] (yield goal)  
None of soil is ≥ 161 ppm for K Test

**Alfalfa**  
Amount of P<sub>2</sub>O<sub>5</sub> = [18.57 - 0.93 (Bray P ppm)] (yield goal); or  
[18.57 - 1.16 (Olsen P ppm)] (yield goal)  
None of soil is > 25 ppm (Bray) or > 20 ppm (Olsen)  
Amount of K<sub>2</sub>O = [55.7 - 0.38 (K Test, ppm)] (yield goal)  
None of soil is ≥ 161 ppm for K Test

**Soybeans**  
Amount of P<sub>2</sub>O<sub>5</sub> = [1.55 - 0.10 (Bray P ppm)] (yield goal); or  
[1.55 - 0.14 (Olsen P ppm)] (yield goal)  
None if soil is > 16 ppm (Bray) or > 12 ppm (Olsen)  
Amount of K<sub>2</sub>O = [2.20 - 0.0183 (K Test, ppm)] (yield goal)  
None if soil is ≥ 121 ppm for K Test

<sup>1</sup>For tabulated amounts of fertilizer, see Minnesota Extension Service publications.  
Numbers taken from Minnesota Extension Service publications.

**Area/Volume Conversion Factors**

**AREA:**

1 acre = 43,560 feet<sup>2</sup> = 0.405 hectare  
1 hectare = 10,000 meter<sup>2</sup>  
1 yard<sup>2</sup> = 0.836 meter<sup>2</sup>  
1 chain<sup>2</sup> = 0.10 acres = 16 rods<sup>2</sup>  
1 mile<sup>2</sup> = 640 acres

**VOLUME:**

1 bushel (level) = 1.244 feet<sup>3</sup> = 8 gallons (dry)  
= 9.31 gallons (liquid) = 35.24 liters  
1 liter = 1,000 mL or cm<sup>3</sup>  
1 gallon (liquid) = 3.78 liters = 128 fluid ounces  
= 4 quarts = 8 pints  
1 acre-foot = 43,560 feet<sup>3</sup> = 1,613 yards<sup>3</sup>  
= 325,851 gallons  
1 cup = 236.6 cm<sup>3</sup> = 0.236 liters  
= 8 ounces = 16 tablespoons

**More Conversion Factors**

**SPEED:**

1 mile per hour = 1.467 feet per second  
= 88 feet per minute = 26.8 meters per hour

**OTHER:**

1 pound per acre = 1.12 Kg/ha  
1 pound per gallon = 0.119 Kg/L  
Parts per million (ppm) = ug/g = mg/L  
1 gallon per acre = 9.35 L/ha

**LIQUID MANURE DENSITY:**

1 gallon = 8.33 lbs

**Soil Testing Conversions**

Plow layer (6-7 inches) = ppm X 2 = lb./acre  
Top 12 inches = ppm X 4 = lb./acre



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