

SOYBEAN nutrient recommendations

SOIL TEST LEVEL OF THE FIELD

Yield goal (BU/A)	SOIL TEST LEVEL OF THE FIELD					
	Very Low	Low	Optimum	High	Very High	Ex. High
Phosphate (P₂O₅)	----- LB (P ₂ O ₅) OR (K ₂ O) / ACRE TO APPLY -----					
15-25	--	25	15	10	--	0
26-35	--	35	25	15	--	0
36-45	--	40	30	15	--	0
46-55	--	50	40	20	--	0
56-65	--	60	50	25	--	0
66-75	--	65	55	30	--	0
76-85	--	75	65	35	--	0
Potash (K₂O)	90	45, 70*	30	15	10	0
26-35	100	55, 80*	40	20	10	0
36-45	115	70, 95*	55	30	15	0
46-55	130	85, 110*	70	35	20	0
56-65	145	100, 125*	85	45	20	0
66-75	160	115, 140*	100	50	25	0
76-85	170	125, 150*	110	55	30	0

-- Very low and very high category does not exist for soil test phosphorus
* Use lower values on sandy or organic soils

SOIL pH liming recommendations

Crop	Target pH
Alfalfa	6.8
Corn, silage or grain	6.0
Pastures (grass or legume-grass)	6.0
Red Clover	6.3
Soybeans	6.3
Wheat	6.0

- Lime should be applied and incorporated at least 6 to 12 months prior to planting an acid sensitive crop such as alfalfa.
- Lime recommendations are made using the target pH for the most acid sensitive crop in a 4-year rotation.
- Application rates for lime should never exceed 12 ton/acre (8 ton/acre for potatoes).
- No additional lime should be applied until the most recent application has had 2-3 years to equilibrate with the soil.

LEGUME nitrogen credits

FORAGE		medium / fine textured		sandy soils		REGROWTH
		>8"	<8"	>8"	<8"	
Alfalfa 1st Year		----- LB N / ACRE TO CREDIT -----				In the second cropping year following a fair or good stand on a fine/medium textured soil, take a 50 lb N/acre credit.
70-100% alfalfa, more than 4 plants/ft ²	Good	190	150	140	100	
30-70% alfalfa, 1.5 - 4 plants/ft ²	Fair	160	120	110	70	
0-30% alfalfa, less than 1.5 plants/ft ²	Poor	130	90	80	40	
Red Clover, Birdsfoot Trefoil, 80% of alfalfa credit for similar stands.						
GREEN MANURE, lb N/a						
Alfalfa, 60-100	Use 40 lb N/acre credit if less than 6 inches of growth before tillage. Use upper end of range for spring seedings that are plowed under the following spring; use low end for fall seedings.					
Sweet Clover, 80-120						
Red Clover, 50-80						
FIELD CROPS, lb N/a						
Soybean, 40	No credit on sandy soils. Soy credit applies to non-legume crops other than corn; soybean N for corn is accounted in Corn Nitrogen Guidelines.					
Pea, Snap or Lima bean, 20						

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For more copies, please contact us at:
email (npm@hort.wisc.edu)
phone (608) 265-2660
website (ipcm.wisc.edu)



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ALFALFA nutrient recommendations

SOIL TEST LEVEL OF THE FIELD

Yield goal (TONS/A)	SOIL TEST LEVEL OF THE FIELD					
	Very Low	Low	Optimum	High	Very High	Ex. High
Phosphate (P₂O₅)	----- LB (P ₂ O ₅) OR (K ₂ O) / ACRE TO APPLY -----					
1.0-2.5	65	50	25	15	--	0
2.6-3.5	80	65	40	20	--	0
3.6-4.5	90	75	50	25	--	0
4.6-5.5	105	90	65	35	--	0
5.6-6.5	120	105	80	40	--	0
6.6-7.5	130	115	90	45	--	0
7.6-8.5	145	130	105	55	--	0
Potash (K₂O)	155	145	105	55	25	0
2.6-3.5	230	220	180	90	45	0
3.6-4.5	290	280	240	120	60	0
4.6-5.5	350	340	300	150	75	0
5.6-6.5	410	400	360	180	90	0
6.6-7.5	470	460	420	210	105	0
7.6-8.5	530	520	480	240	120	0

-- Very high category does not exist for soil test phosphorus

Legume Forage

Where an alfalfa stand is to be maintained for more than three years **increase** the annual top-dressed K₂O by 20%. Apply 30 lb N/acre in the seeding year if grown on soils with less than 2% organic matter. Apply 40 lb N/acre to legume pasture in seeding year on sandy soils and 20 lb N/acre on soils with more than 2% organic matter.

Nurse Crops

Where barley or oats are seeded with a forage legume, **eliminate** or **reduce N** for the small grain by 50%.



Corn Nitrogen Guidelines

Soil ¹	Previous crop	N: Corn Price Ratio			
		0.05	0.10	0.15	0.20
HIGH/VERY HIGH YIELD POTENTIAL SOILS	Corn, Forage legumes, Legume vegetables, Green manures ⁵	170 ³	150	130	115
	Soybean, Small grains ⁶	155----185 ⁴	135----160	120----145	105----125
MEDIUM/LOW YIELD POTENTIAL SOILS	Corn, Forage legumes, Legume vegetables, Green manures ⁵	140	120	105	95
	Soybean, Small grains ⁶	125----160	105----135	95----115	80----105
SANDS/ LOAMY SANDS	Irrigated—All crops ⁵	125	110	100	95
	Non-irrigated—All crops ⁵	110----140	100--115	95--110	85--100
SANDS/ LOAMY SANDS	Irrigated—All crops ⁵	110	85	70	60
	Non-irrigated—All crops ⁵	90----125	70---95	60---80	50---70
SANDS/ LOAMY SANDS	Irrigated—All crops ⁵	215	205	195	180
	Non-irrigated—All crops ⁵	205---225	195---215	180---205	170---195
SANDS/ LOAMY SANDS	Irrigated—All crops ⁵	140	130	120	110
	Non-irrigated—All crops ⁵	130---150	120---140	110---130	100---120

Additional Guidelines:

- ✓ For maximum silage yield, use N rate for 0.05 price ratio. To adjust rates for silage, use price ratio that reflects typical prices for N and grain.
- ✓ If >50% residue at planting, use upper end of range.
- ✓ If all N is from organic sources, use top end of range. Plus, up to 20 lb N/acre as starter may be used.
- ✓ For medium & fine-textured soils with >10% soil organic matter, use low end of range; <2% OM, use high end of range.
- ✓ For coarse-textured, medium yield potential soils with <2% OM, use high end of range; >2% OM, use mid to low end of range.
- ✓ When corn follows small grains on medium & fine-textured soils, use the mid to low end of range.
- ✓ For irrigated, medium yield potential soils, use rates for high yield potential soils.
- ✓ If potential for **carry-over (residual) N**, use low end of range or use the high end and subtract preplant soil nitrate test (PPNT) credits.

GRAIN

CORN nutrient recommendations

SOIL TEST LEVEL OF THE FIELD

Yield goal (BU/A)	SOIL TEST LEVEL OF THE FIELD					
	Very Low	Low	Optimum	High	Very High	Ex. High
Phosphate (P₂O₅)	----- LB (P ₂ O ₅) OR (K ₂ O) / ACRE TO APPLY -----					
71-90	65	55	30	15	--	0
91-110	75	65	40	20	--	0
111-130	80	70	45	25	--	0
131-150	90	80	55	30	--	0
151-170	95	85	60	30	--	0
171-190	105	95	70	35	--	0
191-220	110	100	75	40	--	0
Potash (K₂O)	70	55	25	15	5	0
91-110	75	60	30	15	10	0
111-130	80	65	35	20	10	0
131-150	85	70	40	20	10	0
151-170	90	75	45	25	10	0
171-190	95	80	50	25	15	0
191-220	105	90	60	30	15	0
Phosphate (P₂O₅) @ 35% DM	85	70	45	25	--	0
16 - 20	105	90	65	35	--	0
20 - 25	120	105	80	40	--	0
25 - 35	150	135	110	55	--	0
Potash (K₂O)	160	150	110	55	30	0
16 - 20	200	190	150	75	40	0
20 - 25	235	225	185	95	45	0
25 - 35	300	290	250	125	65	0

-- Very high category does not exist for soil test phosphorus

SILAGE

¹ To determine soil yield potential, consult UWEX publication A2809 or contact your county agent or agronomist.

² Includes N in starter.

³ Maximum return to N (MRTN) rate.

⁴ Profitability range within \$1/acre of MRTN rate.

⁵ Subtract N credits for forage legumes, legume vegetables, animal manures, green manures.

⁶ Subtract N credits for animal manures and second year forage legumes.

N: Corn Price Ratios

Price of Corn (\$/bu corn)

Price of N (\$/lb N)	N: Corn Price Ratios									
	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	
0.25	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.06	0.05	
0.30	0.11	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.06	
0.35	0.13	0.12	0.11	0.10	0.09	0.09	0.08	0.08	0.07	
0.40	0.15	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08	
0.45	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.10	
0.50	0.18	0.17	0.15	0.14	0.13	0.13	0.12	0.11	0.11	
0.55	0.20	0.18	0.17	0.16	0.15	0.13	0.13	0.12	0.12	
0.60	0.22	0.20	0.18	0.17	0.16	0.14	0.14	0.13	0.13	
0.65	0.24	0.22	0.20	0.19	0.17	0.16	0.15	0.14	0.14	
0.70	0.25	0.23	0.22	0.20	0.19	0.18	0.16	0.16	0.15	
0.75	0.27	0.25	0.23	0.21	0.20	0.19	0.18	0.17	0.16	
0.80	0.29	0.27	0.25	0.23	0.21	0.20	0.19	0.18	0.17	

To use an online calculator go to <http://www.soils.wisc.edu/extension/>

MANURE information

APPROX. AVAILABLE NUTRIENT CONTENT

1ST YEAR [2ND YEAR]

	N	N*	P ₂ O ₅	K ₂ O
Dairy				
Solid (lb/ton)	3 [1]	4 [1]	3 [1]	7 [1]
Liquid (lb/1000 gal)	7 [3]	10 [2]	5 [1]	16 [2]
Beef				
Solid (lb/ton)	4 [1]	5 [1]	5 [1]	9 [1]
Liquid (lb/1000 gal)	5 [2]	7 [2]	5 [1]	16 [2]
Swine				
Solid (lb/ton)	7 [1]	9 [2]	6 [1]	7 [1]
Liquid (lb/1000 gal)				
Indoor Pit	25 [5]	33 [5]	25 [4]	24 [3]
Outdoor Pit	17 [3]	22 [4]	10 [1]	16 [2]
Farrow-nursery				
Indoor Pit	13 [2]	16 [3]	14 [2]	18 [2]
Poultry				
Solid (lb/ton)	20 [4]	24 [4]	30* [5]	24 [3]
Liquid (lb/1000 gal)	8 [2]	10 [1]	6 [1]	10 [1]
Horse				
Solid (lb/ton)	3 [1]	4 [1]	4 [0]	8 [1]

* Manure incorporated within 3 days
* 24 for turkey

MANURE OUTPUT*

Animal	weight	lb/day	ton/year	gal/day	1000 gal/year
Dairy	1400 lb	148	27	17.7	6.5
Beef	1100 lb	80	15	9.5	3.5
Swine	150 lb	9.5	1.7	1.2	0.44
Chicken (broiler)	2 lb	0.18	0.031	0.02	0.008
Horse	1000 lb	50	9.1	6.0	2.2

*Volume as excreted.

DETERMINING MANURE APPLICATION RATE

Step 1: Figure load size:

Weigh spreader in tons for solid or semi-solid manure
Use 90% tank capacity in gallons for liquid manure

Step 2: Determine field acreage:

$$\frac{\text{field length (ft)} \times \text{field width (ft)}}{43,560 \text{ ft}^2/\text{a}} = \text{acres}$$

Step 3: Calculate manure application rate:

$$\frac{[(\# \text{ of loads}) \times (\text{load size})]}{\text{field acreage}} = \text{tons or gallons / acre}$$



Program contact:

Northwest Region Paul Kivlin (800)228-8672

South Central Region Kevin Shelley (800)994-5853

Southeast Region Richard Proost (800)994-5852

Southwest Region Amber Radatz (608) 235-5182

Karen Talarezyk (800) 745-9712

Madison Scott Sturgul (877) 426-0176

Nutrient Management

FAST FACTS



indicates information pertains to Wisconsin only.

PLANTING & HARVEST information

DETERMINING PLANT POPULATIONS

Row Width	20"	28"	30"	32"	36"	38"	40"
Row Length*	26'1"	18'8"	17'5"	16'4"	14'6"	13'9"	13'1"

*Row length required to equal 1/1000 acre.

Calculation: (# of plants in row length) x 1000 = plants/acre

NUTRIENTS REMOVED BY CROP AT HARVEST

	P ₂ O ₅	K ₂ O
lb per yield unit		
Alfalfa* / Red Clover , per ton (dry matter)	13	60
Barley ,		
Grain, per bu (1 bu = 48 lb @ 14.5% moisture)	0.40	0.35
Straw, per ton (dry matter)	10	32
Corn		
Grain per bu (1 bu = 56 lb @ 15.5% moisture)	0.38	0.29
Silage, per ton (65% moisture)	3.6	8.3
Sweet, per ton (fresh)	3.3	6.0
Outlage , per ton (dry matter)	11	44
Oats		
Grain, per bu/a (1 bu = 32 lb @ 14% moisture)	0.29	0.19
Straw, per ton (dry matter)	9.4	47
Potatoes , per cwt (fresh)	0.12	0.50
Rye		
Grain, per bu/a (1 bu = 56 lb @ 14% moisture)	0.41	0.31
Straw, per ton (dry matter)	3.7	21
Sorghum , Grain, per bu (1bu = 56 lb @ 14% moisture)	0.40	0.40
Sorghum-Sudan , Forage, per ton (65% moisture)	15	60
Soybean*		
Grain, per bu (1 bu = 60 lb @ 13% moisture)	0.80	1.4
Straw, per ton (dry matter)	5.4	19
Wheat		
Grain, per bu (1 bu = 60 lb @ 13.5% moisture)	0.50	0.35
Straw, per ton (dry matter)	6.0	28

*Nitrogen removal by alfalfa is 60 lb N/ton and by soybeans is 4 lb N/bu.

CONVERTING POUNDS HARVESTED TO BUSHELS WITH % MOISTURE CONTENT CORRECTIONS

Shelled Corn

$$[\text{lbs harvested} \times (1 - \% \text{ moisture in corn})] \div 47.32 = \text{bu @ 15.5\% moisture}$$

Ear corn

$$\text{lbs harvested} \div \text{number from chart below} = \text{bu @ 15.5\% moisture}$$

moisture %	15	15.5	16	17	18	19	20	21	22	23	24	25	26	27
equation #	68.1	68.6	69.2	70.4	71.6	72.8	74.1	75.4	76.6	78.0	79.4	80.7	82	83.4

Soybeans or wheat

$$\text{lbs harvested} \times (1 - \% \text{ foreign matter}) = \text{adjusted lbs harvested}$$

$$[\text{adjusted lbs} \times (1 - \% \text{ moisture})] \div 52.2 = \text{bu soybeans @ 13\% moisture}$$

$$\text{bu wheat @ 0\% moisture}$$

CALCULATING ACRES HARVESTED:

$$\text{acres harvested} = \frac{[\text{row length(ft)} \times \text{row width(ft)} \times \# \text{ of rows harvested}]}{43,560 \text{ ft}^2/\text{acre}}$$

Example with corn harvested by combine :

- Step 1: 12,580 lbs corn harvested @ 21.35% moisture
12,580 lbs x (1 - .2135) ÷ 47.32 = 209 bu of corn @ 15.5 % moisture
- Step 2: Four-row harvester: 16 rows , each 30 inch (2.5 ft) row is 1210 feet long
(1210 ft x 2.5 ft x 16 rows) ÷ 43,560 ft²/acre = 1.10 acres
- Step 3: 209 bu of corn ÷ 1.10 acres = 190 bu/acre

FERTILIZER ANALYSIS

	N	P ₂ O ₅	K ₂ O	other
% content				
Nitrogen				
Ammonium nitrate	34	0	0	
Ammonium sulfate (AMS)	21	0	0	24(S)
Ammonium thiosulfate (ATS)	12	0	0	26(S)
Anhydrous ammonia	82	0	0	
Aqueous ammonia	20	0	0	
Calcium nitrate (CN)	15	0	0	17(Ca)
Urea	46	0	0	
28% Urea ammonium nitrate (UAN)	28	0	0	
32% UAN	32	0	0	
Phosphorus				
Ammonium polyphosphate (dry)	15	62	0	
Ammonium polyphosphate (liquid)	10	34	0	
Diammonium phosphate (DAP)	18	46	0	
Monoammonium phosphate (MAP)	11	52	0	
Triple superphosphate (TSP)	0	46	0	
Potassium				
Potassium chloride (muriate of potash)	0	0	60-62	
Potassium-magnesium sulfate	0	0	22	22(S),11(Mg)
Potassium nitrate	13	0	44	
Potassium sulfate	0	0	50	18(S)

Liquid weights:
1 gallon water weighs 8.3 lbs
1 gallon UAN (28%) weighs 10.6 lbs
1 gallon 10-34-0 weighs 11.6 lbs
1 gallon 9-18-9 weighs 11.1 lbs

CONVERSIONS

Take column 1	multiply by column 2	to get column 3
acre (a)	43,560	square feet (ft ²)
acre (a)	0.405	hectare (ha)
square mile (mi ²)	640	acres (a)
cubic yard (yd ³)	27	cubic feet (ft ³)
cubic feet (ft ³)	7.48	gallons (gal)
bushel (bu)	1.244	cubic feet (ft ³)
bushel (bu)	8	gallons - dry
bushel (bu)	9.31	gallons - liquid
ounces (oz)	29.6	milliliters (ml)
gallon (gal)	3.78	liters (l)
gallon (gal)	128	fluid ounces (fl oz)
gallon (gal)	4	quart (qt)
acre-foot	43,560	cubic feet (ft ³)
acre-foot	325,851	gallons (gal)
chain (ch)	66	feet (ft)
chain (ch)	4	rods (r)
rods (r)	16.5	feet (ft)
mile (mi)	5280	feet (ft)
ton (short)	2,000	pounds (lb)
ton (long)	2,230	pounds (lb)
gallons/acre (gal/a)	9.354	liters/hectare (l/ha)
miles/hour (mph)	88	feet/minute (ft/min)
pounds/acre (lb/a)	1.12	kilograms/hectare (kg/ha)
P ₂ O ₅ (lb)	0.44	P (lb)
K ₂ O (lb)	0.83	K (lb)
ppm-plow layer (6 in)	2	lb/acre (lb/a)
ppm-top soil (12 in)	4	lb/acre (lb/a)

To get column 1, divide column 3 by column 2