

SOYBEAN nutrient recommendations

SOIL TEST LEVEL OF THE FIELD

	SOIL TEST LEVEL OF THE FIELD						
	Very Low	Low	Optimum	High	Very High	Ex. High	
Phosphate (P ₂ O ₅)	Yield goal (bu/acre) -----lb P ₂ O ₅ or K ₂ O/acre to apply-----						
	26-35	65	55	25	15	-	0
	36-45	70	60	30	15	-	0
	46-55	80	70	40	20	-	0
	56-65	90	80	50	25	-	0
	66-75	95	85	55	30	-	0
	76-85	105	95	65	35	-	0
	86-95	110	100	70	35	-	0
Potash (K ₂ O)	26-35	85	70	40	20	10	0
	36-45	100	85	55	30	15	0
	46-55	115	100	70	35	20	0
	56-65	130	115	85	45	20	0
	66-75	145	130	100	50	25	0
	76-85	155	140	110	55	30	0
	86-95	170	155	125	65	30	0
	96-105	185	170	140	70	35	0

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

ALFALFA nutrient recommendations

SOIL TEST LEVEL OF THE FIELD

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	Very Low	Low	Optimum	High	Very High	Ex. High	
Phosphate (P ₂ O ₅)	Yield goal (tons/acre) -----lb P ₂ O ₅ or K ₂ O/acre to apply-----						
	1.5-2.5	65	55	25	15	-	0
	2.6-3.5	80	70	40	20	-	0
	3.6-4.5	90	80	50	25	-	0
	4.6-5.5	105	95	65	35	-	0
	5.6-6.5	120	110	80	40	-	0
	6.6-7.5	130	120	90	45	-	0
	7.6-8.5	145	135	105	55	-	0
Potash (K ₂ O)	1.5-2.5	160	145	105	55	25	0
	2.6-3.5	235	220	180	90	45	0
	3.6-4.5	295	280	240	120	60	0
	4.6-5.5	355	340	300	150	75	0
	5.6-6.5	415	400	360	180	90	0
	6.6-7.5	475	460	420	210	105	0
	7.6-8.5	535	520	480	240	120	0
	8.6-9.5	595	580	540	270	135	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.

Nurse Crops:

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

LEGUME nitrogen credits

FORAGE

Alfalfa 1 st Year Credit	Regrowth:	MEDIUM / FINE-TEXTURED SOILS		SANDS / LOAMY SANDS	
		>8"	<8"	>8"	<8"
In the 2nd cropping year following a fair or good stand on a fine/medium textured soil, take a 50 lb N/acre credit.		----- lb N /acre to credit -----			
Stand Density:					
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					
Alfalfa	60-100 lb N/acre	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 lb N/acre				
Red Clover	50-80 lb N/acre				
FIELD CROPS					
Soybean	20 lb N/a	No credit on sandy soils. Do not take soybean credit when corn or wheat is grown; the rotation effect is factored into the N rate guidelines.			
Pea, Snap or Lima bean	20 lb N/acre				

Corn Nitrogen Guidelines

Soil ¹	Previous Crop	N:corn Price Ratio			
		0.05	0.10	0.15	0.20
LOAMY: HIGH YIELD POTENTIAL SOILS	Corn, forage legumes, legume vegetables, green manures ⁵	190 ³ 170 ---- 210 ⁴	165 155 ---- 180	150 140 ---- 160	135 125 ---- 150
	Soybean, small grains ⁶	140 125 ---- 160	120 105 ---- 130	105 95 ---- 115	90 80 ---- 105
LOAMY: MEDIUM YIELD POTENTIAL SOILS	Corn, forage legumes, legume vegetables, green manures ⁵	145 130 ---- 160	125 115 ---- 140	115 105 ---- 125	105 95 ---- 110
	Soybean, small grains ⁶	130 110 ---- 150	100 85 ---- 120	85 70 ---- 95	70 60 ---- 80
SANDS/LOAMY SANDS	Irrigated—all crops ⁵	215 200 ---- 230	200 185 ---- 210	185 175 ---- 195	175 165 ---- 185
	Non-irrigated—all crops ⁵	140 130 ---- 150	130 120 ---- 140	120 110 ---- 130	110 100 ---- 120

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.

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 loamy (medium & fine-textured) soils with >10% soil organic matter (OM), use low end of range.
- For all soils with <2% soil OM, use high end of range.
- For sandy (coarse-textured) soils with <2% OM, use high end of range; 2-10% OM, use mid to low end of range; 10-20% OM, use non-irrigated guidelines—regardless of irrigation status; >20% OM, apply 80 lb N/acre.
- When corn follows small grains on loamy soils, use the mid to low end of range.
- For loamy irrigated or drained 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.

CORN nutrient recommendations

SOIL TEST LEVEL OF THE FIELD

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	Very Low	Low	Optimum	High	Very High	Ex. High	
Phosphate (P ₂ O ₅)	Yield goal (bu/acre) -----lb P ₂ O ₅ or K ₂ O/acre to apply-----						
	91-110	80	70	40	20	-	0
	111-130	85	75	45	25	-	0
	131-150	95	85	55	30	-	0
	151-170	100	90	60	30	-	0
	171-190	110	100	70	35	-	0
	191-210	115	105	75	40	-	0
	211-230	125	115	85	45	-	0
Potash (K ₂ O)	231-250	130	120	90	45	-	0
	251-270	140	130	100	50	-	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
	191-210	105	90	60	30	15	0
Phosphate (P ₂ O ₅)	211-230	110	95	65	35	15	0
	231-250	115	100	70	35	20	0
	251-270	120	105	75	40	20	0
	@ 35% DM (tons/acre) -----lb P ₂ O ₅ or K ₂ O/acre to apply-----						
	15-20	105	95	65	35	-	0
	20-25	120	110	80	40	-	0
	25-30	140	130	100	50	-	0
	30-35	155	145	115	60	-	0
Potash (K ₂ O)	35-40	175	165	135	70	-	0
	15-20	200	185	145	75	35	0
	20-25	240	225	185	95	45	0
	25-30	285	270	230	115	60	0
	30-35	325	310	270	135	70	0
	35-40	365	350	310	155	80	0

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

For links to NPM's free apps for agriculture: including Wisconsin's Corn Nitrogen Rate Calculator and Nitrogen Price Calculator



N:corn Price Ratios

Price of N (\$/lb N) Price of N = [\$/ton N fertilizer x (100 / % N in fertilizer)] / 2000	Price of Corn (\$/bu corn)											
	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25
0.25	0.10	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.06	0.05	0.05	0.05
0.30	0.12	0.11	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.06
0.35	0.14	0.13	0.12	0.11	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.07
0.40	0.16	0.15	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08	0.08	0.08
0.45	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.10	0.09	0.09
0.50	0.20	0.18	0.17	0.15	0.14	0.13	0.13	0.12	0.11	0.11	0.10	0.10
0.55	0.22	0.20	0.18	0.17	0.16	0.15	0.13	0.13	0.12	0.12	0.11	0.11
0.60	0.24	0.22	0.20	0.18	0.17	0.16	0.14	0.14	0.13	0.13	0.12	0.11
0.65	0.26	0.24	0.22	0.20	0.19	0.17	0.16	0.15	0.14	0.14	0.13	0.12
0.70	0.28	0.25	0.23	0.22	0.20	0.19	0.18	0.16	0.16	0.15	0.14	0.13
0.75	0.30	0.27	0.25	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14
0.80	0.32	0.29	0.27	0.25	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15

MANURE information

ESTIMATED AVAILABLE NUTRIENT CONTENT *

1st Year [2nd Year]

Manure units:

Solid (lb/ton); Liquid (lb/1000 gal)

		N			P ₂ O ₅	K ₂ O
		time to incorporation				
		> 3 days	1 hr-3 days	< 1 hr		
Dairy	Solid, >20% DM	2 [1]	3 [1]	3 [1]	3	6
	Solid, 11-20% DM	2 [1]	2 [1]	3 [1]	3	5
	Liquid, 4-11% DM	7 [2]	10 [2]	12 [2]	6	17
	Liquid, <4% DM	4 [1]	6 [1]	7 [1]	3	11
Beef	Solid	3 [1]	4 [1]	5 [1]	6	10
	Liquid	5 [2]	6 [2]	8 [2]	6	12
Swine	Solid	7 [2]	9 [2]	12 [2]	10	8
	Liquid, finish, indoor pit	17 [4]	22 [4]	28 [4]	14	22
	Liquid, finish, outdoor pit	7 [2]	9 [2]	12 [2]	6	8
Poultry	Liquid, farrow-nursery, indoor pit	8 [2]	10 [2]	14 [2]	6	10
	Solid, chicken	24 [5]	27 [5]	29 [5]	35	26
	Solid, turkey	26 [5]	28 [5]	31 [5]	35	25
Horse	Liquid	6 [1]	7 [1]	7 [1]	6	7
	Solid	2 [1]	3 [1]	4 [1]	5	6

* Because manure nutrient content can vary greatly, manure analysis is encouraged.

MANURE OUTPUT

(volume as excreted)

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	0.033	0.02	0.007
Horse 1000 lb	50	9.1	6.0	2.2

HOW TO DETERMINE 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:

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

Nutrient Management

FAST FACTS

Indicates information pertains to Wisconsin only.

NPM Program Contacts

Northwest Region Paul Kivlin (715) 425-3112
 South Central Region Kevin Shelley (608) 262-7846
 Southeast Region Richard Proost (608) 262-7845
 Southwest Region (608) 219-5170
 Madison Scott Sturgul (608) 262-7486

Nutrient Management Fast Facts is a summary of University of Wisconsin recommendations. For more information, see the UWEX Publication A2809 Nutrient Application Guidelines for Field, Vegetable and Fruit Crops in Wisconsin.

FERTILIZER ANALYSIS & CONVERSIONS

	N	P ₂ O ₅	K ₂ O	other
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

To get column 3, multiply column 1 by column 2

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)	5,280	feet (ft)
ton (t)	2,000	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

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"

* 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
Stover, per ton (dry matter)	4.6	32
Small grain silage, 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 lbs HARVESTED TO bu with % moisture content corrections

Shelled Corn														
[lbs harvested x (1 - % moisture in corn)] ÷ 47.32 = bu @ 15.5% moisture														
Ear Corn lbs harvested ÷ number from chart below = bu @ 15.5% moisture														
moisture %	15	15.5	16	17	18	19	20	21	22	23	24	25	26	27
equation #	68.1	68.2	69.2	70.4	71.6	72.8	74.1	75.4	76.6	78.0	79.4	80.7	82	83.4
Soybean lbs harvested x (1 - % foreign matter) = adjusted lbs [adjusted lbs x (1 - % moisture)] / 52.2 = bu @ 13% moisture														
Wheat lbs harvested x (1 - % foreign matter) = adjusted lbs [adjusted lbs x (1 - % moisture)] / 51.9 = bu @ 13.5% 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 shelled 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

SOIL pH liming recommendations

- 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 potato). The minimum application rate is 1 ton/acre on sandy soils with <1% OM; all other soils 2 ton/acre.
- No additional lime should be applied until the most recent application has had 2-3 years to equilibrate with the soil.

Crop	Target pH
Alfalfa	6.8
Red Clover, Soybean	6.3
Pastures, Corn (silage or grain), Wheat	6.0

This publication is available from the Nutrient and Pest Management (NPM) Program. For more copies, please contact us at:

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