

APPENDIX

Conversion Factors and Tables

Length

Unit of measure	Symbol	mm	cm	m	km	in	ft	mi
millimeter	mm	1	0.1	0.001	---	0.0394	0.003	-
centimeter	cm	10	1	0.01	---	0.394	0.033	-
meter	m	1000	100	1	0.001	39.37	3.281	--
kilometer	km	--	--	1000	1		3,281	0.621
inch	in	25.4	2.54	0.0254	---	1	0.083	-
foot	ft	304.8	30.48	0.305	---	12	1	--
mile	mi	---	--	1609	1.609	---	5280	1

1 inch = 2.54 centimeters
 1 meter = 39.37 inches
 1 mile = 5280 feet
 1 mile = 1760 yards
 1 mile = 1.6 kilometers
 1 mile = 80 chains
 1 mile = 8 furlongs
 1 yard = 91.440 centimeters

1 yard = 3 feet
 1 rod = 16.5 feet
 1 rod = 5.029 meters
 1 rod = 5.5 yards
 1 chain = 22 yards
 1 chain = 4 rods
 1 chain = 100 links

Weights

1 kilogram = 35.274 ounces
 1 kilogram = 2205 pounds
 1 ounce (avoirdupois) = 28.349 grams
 1 pound = 454 grams
 1 pound = 16 ounces

1 ton (short) = 907.185 kilograms
 1 ton (short) = 2000 pounds
 1 ton (long) = 2240 pounds
 1 ton (metric) = 2204 pounds (liquid) = 57.75 cubic inches

Standard Crop Weights

1 bushel wheat = 60 pounds (U.S. Government)
 1 bushel corn = 56 pounds (U.S. Government)
 1 bushel barley = 48 pounds (U.S. Government)
 1 bushel oats = 32 pounds (U.S. Government)
 1 bushel potatoes = 60 pounds (most states in U.S.)
 1 bushel rice = 45 pounds
 1 bushel grain sorghum = 56 pounds

1 bushel of soybeans = 60 pounds
 1 bushel of dry beans = 60 pounds
 1 bushel of cereal rye = 56 pounds
 1 bushel of rapeseed = 50 pounds
 1 bushel of sunflower seed = 24 pounds
 1 bushel of spelt = 40 pounds
 1 bushel of triticale = 56 pounds

Area

Unit of measure	Symbol	m ²	ha	km ²	ft ²	acre	mi ²
square meter	m ²	1	---	---	10.76	---	---
hectare	ha	10,000	1	0.01	107,640	2.47	0.00386
square kilometer	km ²	1x10 ⁶	100	1	---	247	0.386
acre	acre	4,049	0.405	---	43,560	1	0.00156
square mile	mi ²		259	2.59	---	640	1

1 acre = 0.405 hectare
 1 acre = 43,560 square feet
 1 acre = 4840 square yards
 1 acre = 10 square chains
 1 acre = 160 square rods

1 hectare = 2.47 acres
 1 square foot = 144 square inches
 1 square rod = 272.25 square feet
 1 square yard = 9 square feet

Field Acreage

1 Acre = 43,560 sq. ft.
 1/4 section of land = 160 acres = ½ mile by ½ mile
 1 foot by 1 mile = .1212 acres

Acres = $\frac{\text{Area (in square feet)}}{43,560}$

Rectangular or Square Fields

Acres = $\frac{\text{Length x Width (in feet)}}{43,560}$

Triangular Fields

Acres = $\frac{\text{Base x Height (in feet)}}{2 \times 43,560}$

Parallelogram Fields

(opposite sides parallel)

Acres = $\frac{\text{Base x Height (in feet)}}{43,560}$

Trapezoidal Fields (two sides parallel)

Acres = $\frac{(\text{length of A} + \text{length of B}) \times \text{Height (in feet)}}{2 \times 43,560}$

Odd Shaped Fields

Divide into triangles and/or rectangles; find area of each separately; then add areas.

Surveyor's Measure (Area)

1 square link = 62.73 square inches
 1 square pole = 625 square links
 1 square chain = 16 square poles
 1 acre = 10 square chains
 1 square mile = 640 acres
 1 square mile = 1 section
 1 township = 36 square miles

Volume

Unit of measure	Symbol	km ³	m ³	L	Mgal	acre-ft	ft ³	gal
cubic kilometer	km ³	1	1x10 ⁹	--	--	811,000		
cubic meter	m ³	--	1	1000	--	--	35.3	264
liter	L	--	0.001	1	--		0.0353	0.264
million U.S. gallons	Mgal	--	--	--	1	3.07	134,000	1x106
acre-foot	acre-ft	--	1,233	--	0.3259	1	43,560	325,848
cubic foot	ft ³	--	0.0283	28.3	--	--	1	7.48
gallon	gal	--	--	3.785	--	--	0.134	1

Liquid Measures

1 ounce = 29.57 ml = 2 tablespoons
 1 ounce (fluid) = 29.574 cubic centimeters
 1 ounce (fluid) = 1.805 cubic inches
 1 tablespoon = 14.8 ml
 4 tablespoons = 1/4 cup
 8 tablespoons = 1/2 cup
 5 1/3 tablespoons = 1/3 cup
 10 2/3 tablespoons = 2/3 cup
 16 tablespoons = 1 cup
 3 teaspoons = 1 tablespoon
 1 gallon = 231 cubic inches
 1 gallon = 0.1337 cubic feet
 1 gallon = 3.785 liters
 1 gallon = 128 fluid ounces
 1 gallon = 4 quarts = 8 pints

1 gallon = 3785 cubic centimeters
 1 liter = 33.81 ounces (fluid)
 1 liter = 1.816 pints (dry)
 1 liter = 1.057 quarts or 2.11 pints (liquid)
 1 liter = 61.025 cubic inches
 1 liter = 0.264 gallons
 1 liter = 1.06 quarts
 1 cup = 8 fluid ounces
 1 cup = 1/2 pint
 2 cups = 1 pint
 4 cups = 1 quart
 4 quarts = 1 gallon
 8 quarts = 1 peck
 1 quart = 946.4 milliliters

Dry Measures

1 ounce = 28.35 grams
 1 gram = 0.035 ounces
 1 pint = 33.6 cubic inches
 1 quart = 67.2 cubic inches
 1 peck = 537.61 cubic inches
 4 pecks = 1 bushel
 1 standard barrel = 7,056 cubic inches
 1 bushel (dry) = 1.244 cubic feet
 1 bushel (dry) = 2150 cubic inches
 1 bushel (dry) = 35.24 liters
 1 bushel (dry) = 4 pecks
 1 bushel (dry) = 32 quarts

1 cubic foot = 0.804 bushel
 1 cubic foot = 25.714 quarts (dry)
 1 cubic foot = 29.922 quarts (liquid)
 1 cubic foot = 1728 cubic inches
 1 cubic foot = 7.81 gallons
 1 cubic inch = 16.39 cubic centimeters
 1 cubic inch = 0.554 ounces (fluid)
 1 cubic yard = 27 cubic feet
 1 cubic yard = 46,656 cubic inches
 1 cubic yard = 202 gallons
 1 cubic yard = 764.5 liters

Capacities

Cylinder - diameter² x depth x 0.785 = cubic feet

Rectangle - breadth x depth x length = cubic feet

Cubic Feet x 7.48 = gallons

Fertilizer Information

Liquid Fertilizers

Analysis			Weight	Pounds of Plant Food per Gallon		
N	P2O5	K2O	Pounds per Gallon (Approximate)	N	P2O5	K2O
28	0	0	10.66	2.98	0	0
32	0	0	11.06	3.54	0	0
10	34	0	11.65	1.16	3.96	0
7	21	7	11.00	.77	2.31	.77
9	18	9	11.11	.99	1.99	.99
12	0	0	11.00	1.32	0	0

Dry Fertilizers

Product	Analysis (%)			
	N	P2O5	K2O	S
Anhydrous Ammonia (Gas)	82	0	0	0
Urea	46	0	0	0
Ammonium Sulfate	21	0	0	26
Ammonium Nitrate	34	0	0	0
Monoammonium Phosphate (MAP)	11	48	0	0
Diammonium Phosphate (DAP)	18	46	0	0
Triple Superphosphate (TSP)	0	46	0	0
Muriate of Potash	0	0	60	0
Potassium Sulfate	0	0	50	18
Sul-Po-Mag	0	0	22	22

Fertilizer Information (continued)**Conversion Factors for Fertilizer Materials 1/ 2/**

A	B	To Convert	
		A to B	B to A
		Multiply By	
Ammonia, NH ₃ 3/	Ammonium nitrate, NH ₄ NO ₃	4.7	0.2128
Ammonia, NH ₃	Ammonium sulfate, (NH ₄) ₂ SO ₄	3.8794	0.2578
Ammonia, NH ₃	Diammonium phosphate, (NH ₄) ₂ HPO ₄	3.877	0.257
Ammonia, NH ₃	Monoammonium phosphate, NH ₄ H ₂ PO ₄	6.7541	0.1481
Ammonia, NH ₃	Nitrogen, N	0.8224	1.216
Boron, B	Boron oxide, B ₂ O ₃	3.2199	0.3106
Calcium, Ca	Calcium oxide, CaO	1.3992	0.7147
Calcium oxide, CaO	Calcium carbonate, CaCO ₃	1.7848	0.5603
Chlorine, Cl	Potassium chloride, KCL	2.102	0.4755
Copper oxide, CuO	Copper, Cu	0.7988	1.2519
Ferric oxide, Fe ₂ O ₃	Iron, Fe	0.6994	1.4298
Magnesium oxide, MgO	Magnesium, Mn	0.6031	1.6581
Molybdenum oxide, MoO ₃	Molybdenum oxide, MoO ₃	0.6665	1.5004
Nitrogen, N	Ammonium nitrate, NH ₄ NO ₃	2.8573	0.35
Nitrogen, N	Ammonium sulfate, (NH ₄) ₂ SO ₄	4.717	0.212
Nitrogen, N	Calcium cyanamide, CaCN ₂	2.8595	0.3497
Nitrogen, N	Calcium nitrate, Ca(NO ₃) ₂	5.8575	0.1707
Nitrogen, N	Monoammonium phosphate, NH ₄ H ₂ PO ₄	8.2122	0.1218
Nitrogen, N	Potassium nitrate, KNO ₃	7.2185	0.1385
Nitrogen, N	Sodium nitrate, NaNO ₃	6.0681	0.1648
Nitrogen, N	Urea, (NH ₂) ₂ CO	2.1438	0.4665
Phosphorus oxide P ₂ O ₅	Calcium metaphosphate, Ca(PO ₃) ₂	1.3951	0.7168
Phosphorus oxide P ₂ O ₅	Phosphoric acid, H ₃ PO ₄	1.3808	0.7242
Phosphorus oxide P ₂ O ₅	Phosphorus, P	0.4364	2.2914
Potash, K ₂ O	Chlorine equivalent, Cl	0.7527	1.3286
Potash, K ₂ O	Potassium, K	0.8302	1.2045
Potash, K ₂ O	Potassium chloride, KCl	1.5829	0.6318
Potash, K ₂ O	Potassium nitrate, KNO ₃	2.1466	0.4659
Potash, K ₂ O	Potassium sulfate, K ₂ SO ₄	1.8499	0.5406
Sodium oxide, Na ₂ O	Sodium, Na	0.7419	1.3479
Sulfur, S	Gypsum, CaSO ₄ .2H ₂ O	5.3696	0.1862
Sulfuric oxide, SO ₃	Sulfur, S	0.4005	2.4969
Sulfuric oxide, SO ₃	Ammonium sulfate, (NH ₄) ₂ SO ₄	1.6505	0.6059
Sulfuric oxide, SO ₃	Copper sulfate, CuSO ₄	1.9935	0.5016
Sulfuric oxide, SO ₃	Magnesium sulfate, MgSO ₄	1.5035	0.6651
Sulfuric oxide, SO ₃	Manganese sulfate, MnSO ₄	1.886	0.5302
Sulfuric oxide, SO ₃	Zinc sulfate, ZnSO ₄	2.0163	0.496
Zinc oxide, ZnO	Zinc, Zn	0.8034	1.2447
Zinc oxide, ZnO	Zinc sulfate, ZnSO ₄ .7H ₂ O	3.5337	0.283

1/ 1983 FARM CHEMICALS HANDBOOK, page B30

2/ International Atomic Weights for 1961, based on Carbon-12, were used in calculating these factors.

3/ Excluding the nitrate equivalent.

Soil Test Information

one liter = 1000 cubic centimeters = 1000 grams

one gram = 1000 milligrams

one ppm = one mg/l or one part by weight in 1 million parts water

mg/l = 1 milligram (weight) in 1 million parts (volume) or 1 liter.

mg/kg = milligram per kilogram = mg/1000 grams

µg/l = microgram per liter, one microgram is 1 millionth of a gram.

1 percent concentration = 10,000 ppm

ppm x 2 = lb/acre at 6.67 inch depth (acre-furrow-slice)

1 ppm = 8.345 pounds per million gallons of water

1 acre-inch = .6233 gallon of water per square foot

1 ppm = .2255 lb per acre-inch

millimhos per centimeter (mmho/cm) = a measure of the electrical conductivity of the soil

1 mmho/cm = 1 decisiemens per meter (dS/m)

1 millimho = approximately 10 milliequivalents per liter (meq/l)

1 decisiemens per meter = 640 milligrams/l salt

A soil of 4 mmhos/cm or more is considered saline (will have an effect on sensitive crops).

P to P₂O₅ multiply P by 2.29

P₂O₅ to P multiply P₂O₅ by .43

K to K₂O multiply K by 1.20

K₂O to K multiply K₂O by .83

Organic matter - Soil organic matter is an ill-defined term used to cover organic materials in all stages of decomposition. Lignin and humic acid are the most resistant to alteration. Generally organic matter improves infiltration, tilth, moisture holding capacity and the CEC of a soil.

Cation exchange capacity (CEC) = total quantity of cations a soil can adsorb by cation exchange, usually expressed as milliequivalents per 100 grams (meq/100g)

pH - describes the H⁺ ion activity of very dilute acid solutions. Scale is from 1 through 14. A pH of 7.0 is neutral; values less than 7.0 indicate acidity, values greater than 7.0 indicate alkalinity. Each unit change in pH represents a 10-fold change in acidity. A soil with a pH of 5.0 is ten times more acid than a soil with a pH of 6.0.

Pesticide Active Ingredient (AI) Formulas

$$\text{Pounds Commercial Material/acre} = \frac{\text{Pounds AI per acre to be applied}}{\text{Decimal equivalent of \% AI}}$$

$$\text{Gallons Commercial Material/acre} = \frac{\text{Pounds AI per acre to be applied}}{\text{Pounds AI per gallon}}$$

$$\text{Gallons Commercial Material/tank} = \frac{\text{Gallons/tank} \times \text{pounds AI to be applied/acre}}{\text{Gallons/acre} \times \text{pounds AI per gallon}}$$

Rates

1 ounce/square foot	=2,722.5 pounds/acre
1 ounce/square yard	=302.5 pounds/acre
1 ounce/100 square feet	=27.2 pounds/acre
1 pound/100 square feet	=435.6 pounds/acre
1 pound/1,000 square feet	=43.6 pounds/acre
1 pint/acre	=1 fluid ounce/242 square yards
1 gallon/acre	=1/3 ounce/1000 square feet
5 gallons/acre	=1 pint/1,000 square feet
100 gallons/acre	=2.5 gallons/1,000 sq. ft = 1 qt/100 sq. ft
grams/square foot x 96	=pounds/acre
kilograms/48 square feet	=tons per acre
pounds/square feet x 21.78	=tons per acre
100 pounds/acre	=3-1/2 oz/100 sq. ft = 2.5 pounds/1,000 sq. ft
200 pounds/acre	=7-1/2 oz/100 sq. ft
300 pounds/acre	=11 oz/100 sq. ft
400 pounds/acre	=14-3/4 oz/100 sq. ft
500 pounds/acre	=1 lb 2-1/2 oz/100 sq. ft
600 pounds/acre	=1 lb 6 oz/100 sq. ft
700 pounds/acre	=1 lb 10 oz/100 sq. ft
800 pounds/acre	=1 lb 13 oz/100 sq. ft
900 pounds/acre	=2 lb 1 oz/100 sq. ft
1,000 pounds/acre	=2 lb 5 oz/100 sq. ft
2,000 pounds/acre	=4 lb 10 oz/100 sq. ft

1 mile per hour = 1.467 feet per sec
 1 pint/acre = 1 fluid oz./242 sq. yards
 1 gal/acre = 1 pint/605 sq. yards
 1 lb/acre = 1 oz./300 sq. yards

1 cwt/acre = 0.37 oz./sq. yard
 1 mph = 88 ft./minute
 3 mph = 1 chain/15 sec.

A strip 3 ft. wide x 220 chains = 1 acre
 A strip 4 ft. wide x 165 chains = 1 acre
 A strip 5 ft. wide x 132 chains = 1 acre

Miscellaneous Conversion Tables

To convert Column 1 to Column 2, multiply by:	Column 1	Column 2	To convert Column 2 to Column 1, multiply by:
1.609	mile, mi	kilometer, km	0.621
0.914	yard, yd	meter, m	1.094
2.540	inch, in	centimeter, cm	0.394
2.590	mile ² , mi ²	kilometer ² , km ²	0.386
0.00405	acre, A	kilometer ² , km ²	247.1
0.405	acre, A	hectare, ha (0.01 km ²)	2.471
102.8	acre-inch, ac-in	meter ³ , m ³	0.00973
0.2852	cubic foot, ft ³	hectoliter, hl	3.532
0.352	bushel, bu	hectoliter, hl	2.838
0.946	quart (liquid), qt	liter, L	1.057
0.9072	ton (English), T	ton (metric), T	1.102
0.00454	pound, lb	quintal, q	220.5
0.454	pound, lb	kilogram, kg	2.205
2.242	ton (English)/acre	ton (metric)/hectare	0.446
1.121	lb/acre	kg/ha	0.892
1.121	hundredweight/acre	quintal/hectare	0.892
0.0703	lb/inch ² , psi	kg/cm ²	14.22
0.06895	lb/in ² , psi	bar	14.50
1.013	atmosphere, atm*	bar	0.9869
1.033	atmosphere, atm*	kg/cm ²	0.9678
0.06805	lb/in ² , psi	atmosphere, atm*	14.70
0.555(F-32)	Fahrenheit, F	Celsius, C	1.80C + 32
10.764	foot-candle, ft-c	lux	0.0929

* An "atmosphere" may be specified in metric or English units.

Miscellaneous Conversion Tables (continued)

1 ft. ³	=	1728 in. ³	1 gal	=	231 in. ³
		0.037 yd. ³			0.134 ft. ³
		7.48 gal			.005 yd. ³
		62.4 lbs. H ₂ O			8.33 lbs. H ₂ O
1 yd. ³	=	46,656 in. ³	1 ac-in.	=	3630 ft. ³
		27 ft. ³			134.4 yd. ³
		202 gal			27,154 gal.
		2480 lb soil			226,192 lbs. H ₂ O
		0.00744 ac-in			335,312 lbs. soil
		0.00062 ac-ft			
1 acre	=	43,560 ft ²	1 ac-ft	=	43,560 ft. ³
		4,840 yd ²			1613.3 yd. ³
		160 rod ²			325,848 gal.
		208.7 ft. ²			2,722,000 lbs. H ₂ O
		0.405 hectares			4,000,000 lbs. soil
1 ft. ³ /sec.	=	448.8 gpm	1 part per million (ppm)	=	0.00136 ton/ac- ft.
		0.993 ac-in./hr.			227 lb./ac-in.
		23.8 ac-in/day			1 ml /liter
		3600 ft ³ /hr			2 lb/ac. per acre-furrow-slice (6.67 “)
		7.5 gal/sec			
An acre-furrow-slice	=	one acre to a depth of 6 2/3 in.	1 gpm	=	0.00223 ft ³ /sec.
		± 2,000,000 lb of soil			0.00221 ac-in/hr.
					1440 gal/24 hr.
1 lb./in. ² (1 psi)	=	2.31 ft. H ₂ O			0.053 ac-in/24 hr.