

Nutrient Removal by Crops

REMOVAL OF PLANT NUTRIENTS BY CEREALS AND FEED GRAINS (LBS. PER BUSHEL)							
CROP	YIELD	Nitrogen	P ₂ O ₅	K ₂ O	Calcium	Magnesium	Sulfur
Corn	Total	1.50	0.60	1.30	0.21	0.20	0.16
	Stover	0.50	0.25	1.05	0.19	0.14	0.09
	Grain	1.00	0.35	0.25	0.02	0.06	0.07
Cotton/500 lb. Bale	Total	75.00	30.00	50.00	28.00	12.00	13.00
	Residue	35.00	10.00	34.00	25.00	8.00	8.50
	Seed & Lint	40.00	20.00	16.00	3.00	4.00	4.50
Rice	Total	1.05	0.40	1.07	0.16	0.11	0.12
	Straw	0.40	0.12	0.90	0.12	0.06	0.08
	Grain	0.65	0.28	0.17	0.04	0.05	0.04
Sorghum	Total	1.30	0.70	1.65	0.38	0.23	0.19
	Stover	0.45	0.30	1.40	0.31	0.15	0.10
	Grain	0.85	0.40	0.25	0.07	0.08	0.09
Soybeans*	Total	5.50	1.20	2.40	1.70	0.45	0.45
	Straw	1.30	0.30	0.90	1.50	0.22	0.25
	Grain	4.20	0.90	1.50	0.20	0.23	0.20
Wheat	Total	1.75	0.72	1.60	0.26	0.24	0.23
	Straw	0.50	0.12	1.20	0.21	0.10	0.13
	Grain	1.25	0.60	0.40	0.05	0.14	0.10

*Most of the nitrogen is obtained from the atmosphere.

REMOVAL OF PLANT NUTRIENTS BY FORAGES (LBS. PER TON OF DRY HAY)						
CROP	Nitrogen	P ₂ O ₅	K ₂ O	Calcium	Magnesium	Sulfur
Alfalfa*	60.0	15.0	60.0	28.0	5.0	5.0
Red Clover*	56.0	12.5	45.0	24.0	6.0	5.0
Sorghum-Sudan	40.0	15.0	55.0	10.0	6.0	4.5
Cool Season Grass	45.0	12.0	50.0	10.0	4.5	4.5
Warm Season Grass	35.0	10.0	35.0	10.0	5.0	3.5
Grass Pasture (per 100 cow days)	60.0	5.0	17.0	4.0	2.0	2.0

*Most of the nitrogen is obtained from the atmosphere.

A SOIL TEST IS THE BEST BASIS FOR A FERTILIZER RECOMMENDATION

The above tables are an estimate of nutrient removal by crops. Since storage of nitrogen is difficult, use Total Crop Removal for nitrogen recommendations. Where phosphate and potash levels are thought to be optimum, use grain removal values for recommendations. Otherwise, use Total Crop Removal for phosphate and potash recommendations.

SULFUR

Recent studies have shown a response to sulfur on many crops including pasture. If a soil test is not available, apply 10 to 15 pounds of sulfur per acre. The sulfate form of sulfur is immediately available to plants. If elemental sulfur is used it will be one to six months before it becomes available to plants.

Micronutrients

RESPONSES TO MICRONUTRIENTS FOR CROPS ON DEFICIENT SOILS

NUTRIENT	HIGH	MEDIUM	LOW
Boron	Alfalfa, Apple, Grape, Peanut, Rapeseed, Tomato	Cabbage, Corn, Cotton, Peach, Pecan, Subterranean Clover, Vetch	Cucumber, Onion, Irish Potato, Soybean, Wheat
Copper	Citrus, Lettuce, Onion, Tomato, Wheat	Clover, Grain Sorghum, Oat, Soybean, Oil Palm	Broccoli, Corn, Rye
Chloride	Chloride needs are normally met by the chloride carried in potassium fertilizer.		
Iron	Response to iron is most common on soils with high pHs (alkaline). Diverse crops such as grain sorghum and tree fruits respond to fertilization.		
Manganese	Cotton, Lettuce, Onion, Sweet Potato, Soybean	Broccoli, Cabbage, Cucumber, Peach, Tomato	Apple, Corn, Grape, Pecan, Rye
Molybdenum	Responses are most common on legume crops with acid soils because of molybdenum's role in N fixation. It is extremely pH sensitive and its availability decreases as soil acidity increases.		
Zinc	Corn, Grain Sorghum, Onion, Pecan, Irish Potato, Soybean, Rice	Alfalfa, Apple, Sugar Beet, Clover, Cotton	Broccoli, Cabbage, Grape, Peanut

Micronutrients are needed by plants in very small amounts. They are, however, absolutely vital for plant growth.

If the soil pH is kept in the range of 6.0 to 7.0, and the soil contains one to two percent organic matter, most of the seven micronutrients will be available in adequate amounts for normal plant growth. Two notable exceptions to this general statement are boron and zinc.

Boron is normally recommended for alfalfa at the rate of 1 to 1.5 pounds per acre per year. The best time for application is after the first cutting. If boron is considered for other field crops, the recommendation should be based on the results from a tissue analysis. Boron, like many of the micronutrients, is toxic to plants if applied in an excessive amount.

Zinc is the micronutrient that most often produces an economic yield response.

Zinc applications should be based on the recommendation of a current soil or tissue analysis. Field crops most likely to respond to zinc are corn, grain sorghum, rice and soybeans. Zinc applications may be needed most on newly graded soils and soils with a long history of high yields. Irrigated fields often respond to zinc application.

The table above gives good information about the crops most likely to respond to a micronutrient application.

Lime

Lime needs increase rapidly as pH drops

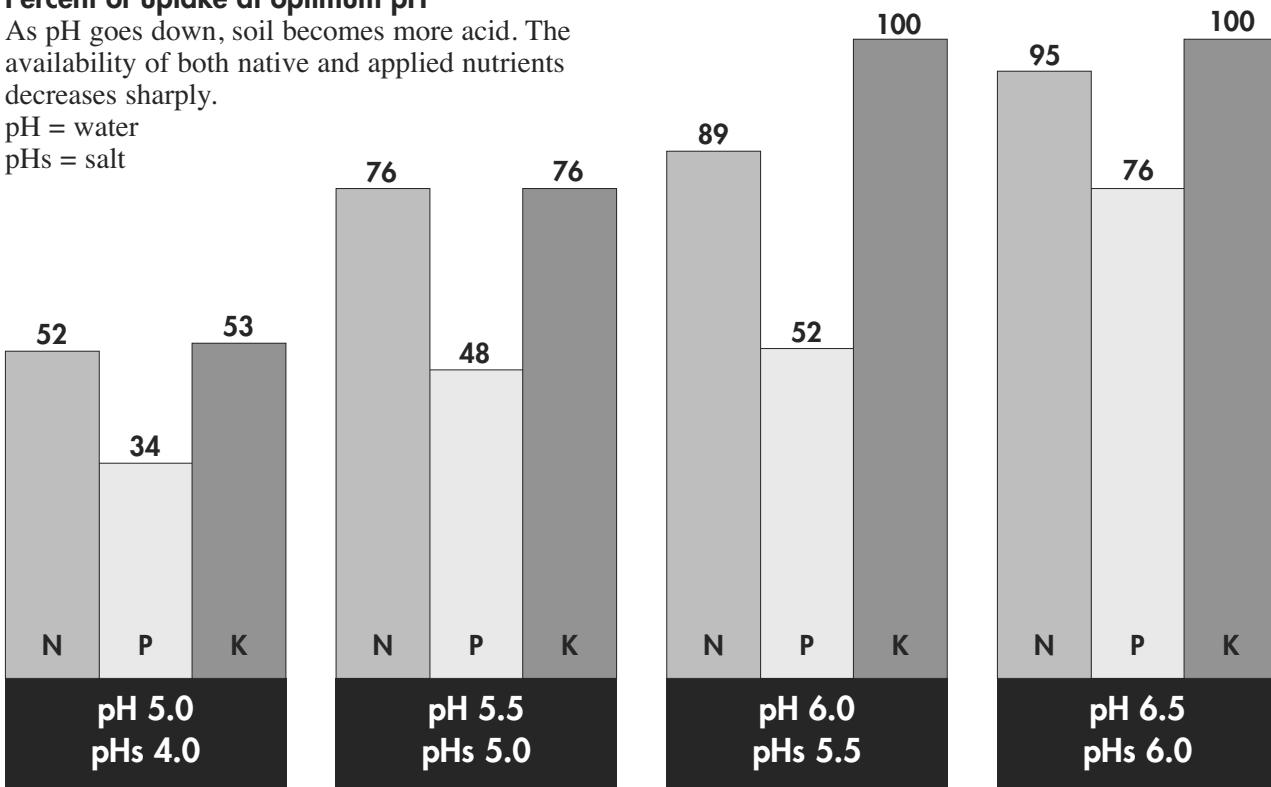
Soil pH simply measures hydrogen ion activity and is expressed in logarithmic terms. The practical significance of the logarithmic relationship is that each unit change in soil pH means a tenfold change in the amount of acidity or basicity. That is, soil with a pH of 6.0 has ten times as much acidity as one with a pH of 7.0. This means lime need increases rapidly as pH drops. The table to the right shows the relative degrees of acidity and basicity, compared to a neutral pH of 7.0.

SOIL PH	ACIDITY/BASICITY COMPARED TO PH 7.0	
9.0	BASIC	100
8.0		10
7.0	NEUTRAL	1
6.0	ACID	10
5.0		100
4.0		1,000

Percent of uptake at optimum pH

As pH goes down, soil becomes more acid. The availability of both native and applied nutrients decreases sharply.

pH = water
pHs = salt



GENERAL

Typical Composition of Some Common Fertilizers

CORN

SORGHUM

SOYBEANS

COTTON

RICE

FORAGES

SMALL GRAINS

LAWN & GARDEN

SEED

FERTILIZER

Source	N (%)	P2O5 (%)	K2O (%)	Ca (%)	Mg (%)	S (%)	Cl (%)
Anhydrous ammonia	82.0	—	—	—	—	—	—
Urea	45-46	—	—	—	—	—	—
Ammonium nitrate	33-34	—	—	—	—	—	—
Urea ammonium nitrate (UAN)	28-32	—	—	—	—	—	—
Ammonium sulfate	21.0	—	—	—	—	24.0	—
Ammonium thiosulfate	12.0	—	—	—	—	26.0	—
Calcium nitrate	15.0	—	—	22.0	1.9-2.2	—	—
Potassium nitrate	13.0	—	44.0	0.5	0.5	0.2	1.2
Sodium nitrate	16.0	—	—	—	—	—	0.6
Monoammonium phosphate	11.0	48-55	—	—	—	1-3	—
Diammonium phosphate	18-21	46-54	—	—	—	—	—
Triple superphosphate	—	44-46	—	—	—	1-1.5	—
Ammonium polyphosphate	10.0	34-37	—	—	—	—	—
Potassium chloride	—	—	60-62	—	—	—	45-47
Potassium magnesium sulfate	—	—	22.0	—	11.0	22.0	—
Potassium sulfate	—	—	50-52	—	—	17.0	—
Gypsum	—	—	—	22.0	—	18.0	—

Properties of Some Common Fertilizers

	NH3	UAN-32	UAN-28	12-0-0-26	10-34-0	10-30-0
Weight/gal (lbs.)	5.15	11.06	10.7	11.1	11.4	12.1
Salt-out temperature (°F)	—	28	1	43	(-26)	—

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