



SOIL

Vegetable Fertilizer Guide

no. 0.509

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Quick Facts...

Only a soil test can determine the nutritional status of a soil.

The test can pay for itself in fertilizer saved and/or increased yields.

Nitrogen is readily leached and can result in economic loss and/or ground water pollution. Therefore, do not store nitrogen in the soil but apply to crops as needed.

Inorganic iron is not an effective preventive for iron chlorosis when applied to an alkaline soil.

One of the wisest investments a vegetable grower can make is a soil test, especially if the land was not previously farmed. Until the nutritional status of the soil is known, a farmer can only guess at its needs. Excessive or insufficient application of plant nutrients is costly and can be avoided by soil testing.

Several values are tested during a Colorado State University soil analysis. After each item are the recommendations for dealing with that item based upon its reading. Descriptions of the methods used to determine each parameter are given in fact sheet 0.502, *Soil Test Explanation*.

pH

A pH between 5.0 and 8.5 is normal. If below 5.0, 4 tons of lime per acre is recommended. A pH above 8.5 may indicate a sodium problem and require a check of the sodium adsorption ratio (SAR). The SAR will suggest what action to take.

It is important to know why salt levels are high. If they are excessively high because of overfertilization or excessive manure application, they may be safely reduced by leaching. However, if high salts are due to an upward movement of salts, it may not be possible to leach them away without installing a drainage system. Economics may dictate that the area should not be planted to vegetable crops. The alternative is to plant crops that are more tolerant to saline conditions (see 0.505, *Crop Tolerance to Soil Salinity*).

Organic Matter

An agricultural soil should have at least 1 percent organic matter to provide minor elements, assist in drainage, improve water holding capacity, and facilitate root penetration and tillage. When less than 1 percent, return all crop residue to the soil and use a high-residue crop or manure to raise the organic matter level.

Nitrogen

Organic matter releases nitrogen when it decomposes and, therefore, is taken into account when recommending nitrogen applications. Nitrogen is readily leached below the root zone, causing economic loss to the grower and possible groundwater pollution. Therefore, rather than trying to store nitrogen in the soil, add it as needed in 50 pounds per acre increments.

Calcium, Magnesium and Sulfur

These nutrients usually are found in adequate quantities in Colorado agricultural soils.

Table 1: Salts.

Salt reading	Water to apply before planting (inches)
3.1-4.0	3
4.1-6.0	6
6.1-8.0	8
8.1-10.0	10
10.1-15.0	12
15.1-20.0	24
20.1-over	do not plant

Table 2: Nitrogen.

	NO ₃ -N Soil test (ppm)	Organic matter (%) Fertilizer (lb/A)		
		0-1.0	1.1-2.0	2.1+
Non-legumes, vegetables, except potatoes and sweet corn	0-9	220	175	130
	10-19	175	130	85
	20-29	130	85	40
	30-39	85	40	0
	40-49	40	0	0
Sweet corn	0-9	250	220	190
	10-19	190	160	130
	20-29	130	100	70
	30-39	70	40	0
	40-49	40	0	0
Legumes: peas and beans	0-10	30	20	10
	11-15	15	10	0
	16-20	10	0	0

Table 3: Potatoes.

NO ₃ -N Soil Test (ppm)	San Luis Valley		
	Centennial, Sangre	Red, McClure, Kennebec	All Other Areas
0-18	140	90	180
19-24	130	80	170
25-30	120	70	160
31-36	110	60	150
>36	100	50	140

Table 4: Phosphorus.

Soil Test P (ppm)	Fertilizer (P ₂ O ₅) lb per acre			
	Non-Legumes	Sweet Corn	Legumes	Potatoes
0-3	220	100	40	240
4-7	175	50	20	180
8-11	130	30	0	120
12-15	45	0	0	60

Table 5: Potassium.

Soil Test K (ppm)	Fertilizer (K ₂ O) lb per acre			
	Non-Legumes	Sweet Corn	Legumes	Potatoes
0-60	200	60	40	160
61-120	150	40	20	80
121-180	50	20	0	40

Table 6: Zinc.

Soil test Zn (ppm)	Fertilizer Zn (lb /acre) for all vegetables
0-0.9	10
1.0-1.5	5

Table 7: Iron.

Soil Test Fe (ppm)	For All Crops Iron Chelate (lb/A) -or- Manure (T/A)	
0-5	10	20
6-10	5	10

Note: Inorganic iron such as ferrous sulfate is ineffective in correcting iron chlorosis when applied to an alkaline soil. It may, however, be applied directly to the foliage as 2 percent solution at 10-day intervals [16 pounds of iron sulfate (20 percent iron) in 100 gallons of water].

Table 8: Manganese for all crops.

Soil pH	Soil Test Mn (ppm)	Mn required (lb/A)
>7.0	0-0.5	5
< or = 7.0	0-0.5	10

Table 9: Copper for all crops.

Soil Test Cu (ppm)	Cu required (lb/A)
0-0.2	5

Table 10: SAR (sodium adsorption ratio).

SAR Soil test	Gypsum (lb/A)
12-20	2,200
21-30	4,400
31-40	6,600

After applying gypsum, leach the soil in accordance with its salt reading.

Lead

The average is 2 to 3 ppm. If soil contains over 100 ppm, there could be excessive lead uptake. Analyze a sample of edible tissue.

Cadmium

The average is 0.1 ppm. If soil contains over 1 ppm, there could be excessive cadmium uptake. Analyze a sample of edible tissue.

Molybdenum

Over 0.5 ppm can produce plants that are toxic to animals, especially alfalfa.

Nickel

One ppm is normal. There is no information on its effect upon plants or animals eating plants.

Boron

- 1 ppm: sensitive crops show toxicity
- 5 ppm: most crops show toxicity
- 10 ppm: tolerant crops show injury

Manure

One ton of cattle feedlot manure will supply approximately 5 pounds of N, 4 pounds of P_2O_5 , and 6 pounds of K_2O during the year it is applied. It will supply a similar amount the second year. Applications of over 20 T/A are not recommended.