service in ACTION

Colorado State University Cooperative Extension

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Vegetable fertilizer guide for Colorado

Based on Colorado State University Soil Lab results

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Quick Facts

The nutritional status of a soil only can be determined by a soil test.
A soil 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, nitrogen should not be stored in the soil but applied to crops as needed.
Inorganic iron is not an effective preventative for iron chlorosis when applied to an alkaline soil.

One of the wisest investments a vegetable grower can make is testing the soil, 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 are costly and can be avoided by soil testing.

The following headings are items that 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 Service in Action sheet *0.502, Soil test explanation.*

pH. Between 5.0 and 8.5 is normal. If below 5.0, 4 tons of lime per acre is recommended. If above 8.5 a sodium problem is suspected and the sodium absorption ratio (SAR) value is checked. This value (see SAR below) will suggest what action to take.

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

It is important to know why salt levels are high. If they are excessively high because of overfertilization or excessive application of manures, 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 then dictate that the area should not be planted to vegetable crops. The alternative would be 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, it is suggested that all crop residue be returned to the soil and that high residue crop or manure be used 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 ground water pollution. Therefore, rather than trying to store nitrogen in the soil, it should

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be added as needed in 50 pounds per acre increments.

Nitrogen

	NO_3-N Soil test (ppm)	Organic matter (%) 0-1.0	1.1-2.0	2.1-over
		Fertilizer lb/A		
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

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

Phosphorus

Soil Test P (ppm)	Fertilizer (P_2O_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

Potassium

Soil test K (ppm)	Fertilizer (K_2O) 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

Zinc

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

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].

Calcium magnesium and sulfur. These nutrients are usually found in adequate quantities in Colorado agricultural soils.

Manganese—for all crops

Soil pH	Soil test Mn (ppm)	Mn required lb/A
>7.0	0-0.5	5
≤7.0	0-0.5	10

Copper—for all crops

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

SAR (sodium absorpton ratio)

SAR Soil test	Gypsum lb/A
12-20	2200
21-30	4400
31-40	6600

After applying gypsum, the soil should be leached in accordance with its salt reading.

Lead. 2-3 ppm is average. If soil contains over 100 ppm, there could be excessive lead uptake. A sample of edible tissue should be analyzed.

Cadmium. 0.1 ppm is average. If soil contains over 1 ppm, there could be excessive cadmium uptake. A sample of edible tissue should be analyzed.

Molybdenum. Over 0.5 ppm could produce plants that would be toxic to animals, especially alfalfa.

Nickel. 1 ppm is normal. 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. A ton of cattle feed-lot 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.