



FERTILIZING VEGETABLE CROPS BASED ON SOIL TEST RESULTS

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Managing soil pH. A soil pH between 6.0 and 7.0 optimizes the availability of nutrients already in the soil. A pH of 6.5 to 6.8 is ideal for most vegetable crops. To raise the pH, lime is added; to reduce it, elemental sulfur can be added. It requires more lime, or sulfur, to change the pH of 'heavier' textured soils (with clay and silt) compared to those that are 'lighter' textured (sandier). Broadcast and mix in lime or sulfur thoroughly well in advance of planting, if possible. Lead time is important if applying more than 2 tons/acre to allow time for the chemical reactions that change soil pH to occur; do not apply more than 4 tons/acre at one time. Use high-mag lime to provide additional magnesium, if needed.

Wood ash can be used in place of lime, though it requires roughly 2 to 3 times more ash by weight to achieve the same increase in pH, and wood ash varies in its liming equivalence. Generally, no more 2 tons/acre should be topdressed at once; apply no more than 3 tons/acre when mixed in. Ash is also a source of P and K; on average it is like a 0-1-3 fertilizer. See: <http://umaine.edu/publications/2279e/>.

Nutrients. Plants require 13 nutrients from the soil, but only a few in large amounts; these are the focus of fertilizer recommendations: nitrogen (N), phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg). Application of these nutrients should be made only if a soil test report shows a need for the nutrient. Ca and Mg levels are typically maintained by liming while N, P and K can be provided from fertilizers, but only after the contributions of compost, manure, cover crops and soil organic matter are considered. Micronutrient and sulfur (S) deficiencies are rare in the Northeast and optimum ranges are not defined; average values in soil are shown instead. If your levels are low the first step is to adjust soil pH to the optimum range. Addition of compost or a volcanic mineral fertilizer may also be beneficial. If boron (B) is low adding 1 lb/acre of boron (B) is advisable for cole crops and beets.

N fertilization. The suggested N fertilizer rate is a guide. Reduce this rate based on credits from other sources. Adjust the timing of N fertilizer application based on type of fertilizer used and environmental conditions. N credits come from soil organic matter, compost, manure and cover crops. As these break down, the amounts of N expected to be made available to crops can vary greatly depending mainly on the C:N ratio of the material and the weather. Expected ranges of amounts of N made available to a crop over a growing season are: 10-40 lb/acre for each 1% soil organic matter, 0-8 lb/ton (0-4 lb/cubic yard) of finished compost, 2-6 lb/ton from fresh dairy manure, 80-160 lb/acre from plow down of a good stand of alfalfa or hairy vetch, 40-60 lb/acre from a good clover stand, and 20-40 lb/acre from lush winter rye. For more information see: <https://nevegetable.org/cultural-practices/nitrogen>.

N fertilizer placement and timing. If possible, mix N fertilizer in the rows or in the beds rather than broadcasting over the entire field. This will improve N recovery by crops and avoid feeding weeds in between rows or beds. If using soluble N fertilizer, reduce recommended pre-plant broadcast rate by about a third and instead apply that amount as an additional sidedressing or topdressing. This will reduce N leaching early in the season. If heavy rains occur, additional sidedressing may be needed.

Starter fertilizer. Applying a soluble P fertilizer may be beneficial early in the season when soils are cool and root growth is slow. Apply 20-30 lb/acre of phosphate in the row when planting early in the season, even if P soil test levels are optimum (but not if they are excessive). Mix starter fertilizer into the crop rows or beds, apply as a band near the seeds or transplants, or water-in when setting plants. Be careful not to include much N or K in the starter fertilizer because these fertilizers can be quite salty.

Organic fertilizers. Many organic fertilizer materials have relatively low nutrient content, and low solubility (compared to synthetic fertilizers). They must be acted on by soil microbes to make nutrients available to plants. Thus, organic fertilizers (such as compost, manure, poultry byproducts or seed meals) are generally best applied early in the season, broadcast and mixed in prior to planting, so they can release nutrients over the next few months. Sidedressing or topdressing established plants should be done using relatively soluble fertilizers, such as Chilean nitrate, or done early enough in the growing season to allow organic materials to break down. Over time, application of materials like rock phosphate and compost can build up large reserves of slowly available nutrients. As the reserves build so does the amount released each season. Test the soil every few years to track the level of phosphate release.

Fertilizer rates. Soil test recommendations should guide the selection of a fertilizer, or combination of fertilizers, to provide the nutrients needed for good crop growth. Avoid use of fertilizers containing a blend of N-P-K unless all three nutrients are recommended; otherwise, excess nutrients may be applied. For more information on managing nutrients and soil health, see:

<http://www.uvm.edu/vtvegandberry/factsheets/NutrientManagementonOrganicVegetableFarms.pdf>

Fertilizer	Typical analysis	Amount of fertilizer needed to add 1 lb of nutrient		
		N	phosphate (P)	potash (K)
alfalfa meal	3-0.5-2.5	33 lb	200 lb	40 lb
blood meal	12-0-0	8.3 lb	--	--
bone meal	3-15-0	33 lb	6.7 lb	--
Chilean nitrate	16-0-0	6	--	--
compost*	1-1-1	100 lb	100 lb	100 lb
greensand	0-0-7	--	--	14 lb
pelletized poultry manure	4-3-4	25 lb	33 lb	25 lb
potassium sulfate	0-0-52	--	--	2 lb
'Pro-Booster'	10-0-0	10 lb	--	--
'Pro-Gro'	5-3-4	20 lb	33 lb	25 lb
rock phosphate**	0-30-0	--	3.3 lb	--
soybean meal	7-2-1	14 lb	50 lb	100 lb
sul-po-mag (+11% Mg)	0-0-22	--	--	4.5 lb
wood ash	0-1-3	--	100 lb	33 lb

*Nutrient content and availability of compost varies, and only a small portion of N is available in the year of application.

For more information see: <http://ag.umass.edu/fact-sheets/compost-use-soil-fertility>

**Only about 10% of the total phosphate in rock phosphate is available in the year of application.

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