Virginia Cooperative Extension

Soil Test Note #2

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Field Crops

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Lime

In general, the best method of lime application is one that will mix the lime most completely with the soil to the plow depth. The following are guidelines for lime application under conventional tillage.

Application of 2 tons or less per acre

This entire rate should be applied to the soil in a single application and then disked or plowed into the soil. Lime applied after plowing should be disked into the soil as thoroughly as possible.

Application of more than 2 tons per acre

For best results, apply one-half of the lime, disk it into the soil or plow it under and then apply the remaining amount and disk it into the soil. This method offers the best incorporation of lime into the soil, which is particularly important when the soil pH is very low and large amounts of lime are needed.

No-till

For no-till cropping systems where incorporation of lime is not possible, single applications should be limited to no more than 2 tons per acre. Where more than 2 tons per acre are recommended (indicating very low soil pH), lime should be incorporated as described above for best results. If incorporation is not feasible, apply one-half the total amount one year and the other half the next year.

Time of Application

The best time to apply lime is several months ahead of planting. This allows for more complete reaction of the lime with the soil. If this cannot be done, apply the lime as far ahead of planting as possible. Failure to apply lime because it could not be applied at the best time is worse than not applying it at all.

Nitrogen

Corn, Grain Sorghum

Nitrogen (N) fertilizer is commonly applied in solution form at planting along with the herbicide. You should use a split application on sandy soils with a high potential for nitrate leaching loss. Part of the N should be applied at planting and the remainder applied when the corn is 12 inches high. Alternatively, nitrogen can be applied with the phosphate and potash before planting. However, this should only be done when phosphate and potash are applied in the spring, because a fall application of nitrogen is not recommended for spring-planted crops. This is due to the high potential for leaching and denitrification losses during the winter. One exception to this would be where a nitrification inhibitor is used to reduce nitrate leaching loss.

When fields have a history of manure utilization, or the corn crop is following a legume such as alfalfa, use the pre-side-dress soil nitrate test (PSNT) to assess the release of mineral N from organic residues and determine the optimum side-dress nitrogen rate. (See Nitrogen Soil Testing For Corn in Virginia, Virginia Cooperative Extension publication 418-016, *http://pubs.ext.vt.edu/418-016/418-016.html*.)

Phosphate, Potash

The recommended phosphate (P_2O_5) and potash (K_2O) fertilizer should be broadcast and incorporated into the soil by plowing or disking where possible. Application can be made either in the fall or in the spring before planting because neither nutrient is very mobile (i.e. low leaching potential) in the soil.

For small grain-soybean or small grain-grain sorghum double crop rotations, phosphate and/or potash fertilizer should be applied before the small-grain crop to permit incorporation of the fertilizer into the soil. For corn-peanut rotations, the phosphate and potash should be applied and incorporated before the corn crop to avoid high concentrations of potash in the peanut pegging zone.

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Starter Fertilizer

Starter fertilizer is fertilizer placed in a band alongside or in direct contact with the seed. Starter fertilizer can be beneficial when planting in cold and/or wet soils. Slow root growth in cold and/or wet soils, which occurs when planting early, reduces plant access to the fertilizer nutrients required for optimum growth. Using a starter fertilizer under these conditions concentrates the plant nutrients near the seed for easier uptake. Crop response to broadcast fertilizer is unlikely in soils testing "High" to "Very High" in P and/or K. Likewise, research conducted in Virginia demonstrated that no grain yield responses will be expected to starter fertilizer when soil-test P and K levels are in the "High" to "Very High" range. On "Medium" and "Low" testing soils, applying P as a starter is a good way of supplying part or all of the P that is needed by the crop.

For band placement, you must be certain that the fertilizer placement attachment on the planter is properly positioned, and all openers are placing the fertilizer band at least 2 inches from the seed and approximately 2 inches below the seed. Any error in placement must be farther from the seed rather than closer than 2 x 2 in order to prevent salt injury to the emerging seedlings.

Rates for starter fertilizer applications are 20 to 60 pounds of nitrogen plus (+) potash per acre for band placement, or 10 to 15 pounds of nitrogen plus (+) potash per acre for seed contact placement (e.g., 50 lbs/A of 6-24-24).

Trace Elements

Deficiencies of the trace elements listed have been found in the following field crops in Virginia:

zinc – corn, small grains, and grain sorghum;

manganese – soybeans and peanuts (manganese and copper deficiencies have been documented in small grains, but there are no soil test calibrations for determining these deficiencies);

boron – peanuts and cotton; and

molybdenum – soybeans.

There is reliable interpretation of soil tests for zinc and manganese. However soil tests have not been found to be a reliable predictor of field crop response to molybdenum or boron. Experiments conducted with corn throughout Virginia showed that boron fertilizer did not increase yields although the boron soil test in all locations was "Low," according to standards being used by some soil testing labs. This indicates that the soil boron test is a poor predictor of corn yield response. Where trace-element deficiencies have been reported but no reliable soil tests are available, a general recommendation is made for the trace element in question.

Winter Annual Legumes as a Nitrogen Source

Winter annual legumes can be used to supplement fertilizer N in the crop rotation in addition to their value as cover crops. Legumes have the ability to "fix" or utilize N from the soil atmosphere to supply their nitrogen needs. When they decompose, legumes release such N into the soil and it becomes available to the next crop in the rotation.

Three winter legumes with high N-supplying potential in Virginia are crimson clover, Austrian winter peas, and hairy vetch. When seeded in August to early September, these legumes will provide about 80 pounds of N per acre to the spring-planted crop. If planted late, 40 to 50 pounds of N can be available to the following crop because the legume will produce less N-containing biomass. This option should be considered where a cover crop is needed, but establishing winter legumes for the sole purpose of supplying N may not be economical. Compare the cost of establishing the legume with the expected return in N fertilizer.

Several precautions should be taken when growing these legumes as an N source. Crimson clover should be planted early (August) since it is susceptible to winterkill if planted late. Severe winters can cause stand reduction even if established early. Crimson clover should not be planted on poorly drained soils. The range of hairy vetch use is limited because the hard seed may become a volunteer weed in subsequent small-grain crops. In counties west of the Blue Ridge Mountains, where few small grains are grown, hairy vetch can be a useful cover crop. Some legumes such as Austrian winter peas are susceptible to significant damage due to grazing by deer. Winter annual legumes should not be used in rotations with peanuts since they can serve as a host for diseases that affect peanuts.

Additional Information

For more information, contact your local Virginia Cooperative Extension office or see *http://www.ext.vt.edu*.