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Liming of Agronomic Crops[1]

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The primary reason for liming acid soil is to improve the yield or quality of the crop being grown. It is difficult to determine the precise factor that is responsible for the improved growth after liming because a number of soil parameters change simultaneously as soil acidity is reduced.

When mineral soil pH is below 5.5, aluminum toxicity can reduce plant growth. Organic soils contain little Al, thus plants can tolerate much lower pH levels on those soils without adverse effects. Many Florida soils are low in magnesium (Mg) and calcium (Ca), and application of dolomitic limestone serves two purposes: it raises the soil pH and it provides Mg and Ca as nutrients.

On the other hand, excessive liming can be detrimental. Many Florida soils are quite low in manganese (Mn) and deficiencies of Mn can occur in soils that are over-limed. The problems begin to appear any time soil pH is raised above 6.3 or so, depending on the level of Mn present and the crop being grown.

Some physiological disorders of plants, such as frenching of tobacco, are associated with high levels of lime. Certain plant diseases, such as black shank of tobacco, are more virulent as the soil pH increases above pH 5.8, and peanuts have a high requirement for Mn and may show yellowing of leaf tissue with high pH.

It has been noted in many Florida fields that are routinely irrigated from deep wells that the soil pH may not decline over time and may actually increase in some instances. Irrigation water drawn from limestone aquifers contains low levels of dissolved calcium carbonate, and this added lime accumulates over time and affects soil pH. Use of soil samples as described below can indicate if irrigation water contributes to the soil pH. Also, the need for lime can be affected by the source and amount of fertilizer applied. Again, a soil test can help reveal the practical effects on soil pH and the need for lime.

In order to obtain the maximum benefits from liming, it is necessary to plan a liming program. Soil and plant factors must be taken into account in determining the type and quantity of lime to apply.

The first step is to take a soil sample that is representative of the field and have it tested by a laboratory that runs a lime requirement test. Since interpretation of soil test results are dependent on the test used and the field correlations of the test, no interpretation will be made here. Refer to SL-129 *UF/IFAS Standardized Fertilization Recommendations for Agronomic Crops* (http://edis.ifas.ufl.edu/ss163) for the target pH for agronomic crops.

The decision of whether to use dolomitic or calcitic ("hi cal") lime should be based primarily on the cost of the material to the producer. However, calcitic lime will increase

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pH faster than dolomitic limestone. When both lime and Mg are needed, dolomite can serve as the liming material of choice. However, if the cost of dolomite is significantly higher than calcite, the producer should consider the alternative of applying calcite as the liming material and Mg in the fertilizer. Application of dolomite as a source of Mg without regard to the liming effect can lead to other nutritional problems in soils with pH above 6.3.

Producers frequently have access to by-product materials that can serve very well for liming agricultural land if the nature of the material is understood and proper precautions are followed. Lime from municipal water treatment plants is an example. Some suggestions follow about the handling and use of lime from water treatment plants:

1. Lime usually has the consistency of a thick paste from water treatment plants. Pile and allow to dry before attempting to spread.

2. Turn with a front-end loader to promote drying. Spread before completely dry and on a calm day to minimize dust drift.

3. Use about 80% as much material as you would agricultural limestone. It will react quickly due to its fineness and thus carry more potential for overliming if not properly used.

4. It is often more difficult to spread since liming soil was not the primary purpose for the material.

Materials sold as aglime are covered by the Florida Commercial Fertilizer Law and must meet specifications of fineness of grind, carbonate equivance, and Mg content (in the case of dolomite). This affords some consumer protection. Lime by-products are not covered by the law, and the consumer must realize more personal responsibility when dealing with such products. Liming is probably the most important soil fertility practice on strongly acid mineral soils. However, many field crops in Florida produce just as well on moderately acid soils as they do on only slightly acid soils.

Lowering Soil pH

Soil pH is sometimes too high for optimum growth and yield of particular plant species. Most plant species are tolerant to a wide range of soil pH. Do not attempt to lower soil pH unless there is evidence that plant growth is being adversely affected by pH.

If the source of the high pH is naturally occurring carbonates (ex. the rockland soils of Dade County or soil containing limestone outcroppings), it is impractical to lower the soil pH on a field-wide basis. In those situations, application of elemental sulfur and micronutrients together in a band is recommended. The micronutrients will remain soluble in the acid band, and adverse effects of high pH may be avoided.

If the soil pH is too high as a result of excessive liming, take note, and pH will gradually become more acid with time. Time is the best cure for over-limed soil in Florida. When high pH has resulted in Mn deficiency on peanuts, ammonium sulfate is effective in lowering the pH enough to make Mn adequate for normal plant growth.

When a more rapid lowering of soil pH is desired, elemental sulfur broadcast and worked into the soil will hasten acidification. Caution : Sulfate forms of sulfur will not lower pH. Elemental sulfur (ex. ag grade sulfur, wettable sulfur, flowers of sulfur) is acted upon by soil microorganisms and sulfuric acid is produced. It is the acid, not the sulfate, that neutralizes the excess carbonate in the soil. The effect on soil pH will probably be slow because of microbial action.