Liming of Agronomic Crops

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The primary reason for liming acid soil is to improve the yield or quality of the crop being grown and to make nutrients more available to plants. 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: (1) it raises the soil pH and (2) it provides Mg and Ca as nutrients and makes other nutrients such as phosphorous (P) more available.

On the other hand, excessive liming can be detrimental. Many Florida soils are quite low in manganese (Mn), and deficiencies of Mn and other micronutrients 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. Peanuts have a high requirement for Mn and may show yellowing of leaf tissue with high pH, although high levels of Ca are required for peanut seed development. If Ca is low in peanut fields but the pH is at the desired level, materials such as gypsum can be used to supply Ca without raising 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 variation. Use of soil samples as described below can indicate if irrigation water contributes to the soil pH. In addition, 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. Soil tests usually confirm that dry corners of irrigation systems have higher nutrient content than the irrigated portion of the field due to less leaching and more uptake by plants under the systems.

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 ma-
terial to the producer. However, calcitic lime will increase
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 agricul-
tural 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 Com-
mercial Fertilizer Law and must meet specifications of
finess of grind, carbonate equivalence, 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 one of the most
important soil fertility practices 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 (or ammonium sulfate, if N
is needed) and micronutrients together in a band is recom-
mended. 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, elemen-
tal sulfur broadcast and worked into the soil will hasten
acidification.

Caution: Sulfate forms of sulfur will not lower pH. Elemen-
tal 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 neutral-
izes the excess carbonate in the soil. The effect on soil pH
will probably be slow because of microbial action.