When lime is added to the soil, two changes occur:

1) the calcium and magnesium compounds applied undergo solution under the influence of a variable partial pressure of carbon dioxide; and

2) an acid colloidal complex will adsorb considerable amounts of calcium and magnesium ions.

When lime, whether the oxide, hydroxide, or the carbonate, is applied to an acid soil, the movement, as solution occurs, is toward the bicarbonate form. This is because the partial pressure of carbon dioxide, usually several hundred times greater than that of atmospheric air, generally is intense enough to prevent the existence of the hydroxide or even the carbonate. The reactions, written only for the purely calcium limes, are as follows:

$$CaO + H_2O \rightleftharpoons Ca(OH)_2$$

$$Ca(OH)_2 + 2H_2CO_3 \rightleftharpoons Ca(HCO_3)_2 + 2H_2O$$

$$CaCO_3 + H_2CO_3 \rightleftharpoons Ca(HCO_3)_2$$

The above equations represent only the solution of the lime in carbonated water. However, the soil situation is not as simple as these reactions might lead one to assume. This is because the soil colloidal matter upsets the equilibrium tendencies by adsorbing the ions of calcium and magnesium. These ions may be taken from the soil solution proper or directly from the solid phase if the contact is sufficiently close (Buckman and Brady 1969).

The changes of lime in the soil are many and complicated. If a soil of pH 5.0 is limed to a more suitable pH value (e.g., pH 6.5) then a number of significant chemical changes occur. For example: (1) the concentration of H^+ ions will decrease; (2) the concentration of OH^- ions will increase; (3) the solubility of iron, aluminum and manganese will decline; (4) the availability of phosphates and molybdates will be augmented; (5) the exchangeable calcium and magnesium will increase; (6) the percentage base saturation will increase; and (7) the availability of potassium may be increased or decreased, depending on soil conditions.

Overliming is an important phenomemon which must be considered. A potential problem is the addition of lime until the pH of the soil is above that required for optimum plant growth. Under such conditions, many crops that ordinarily respond to lime are detrimentally affected, especially during the first season following the lime application. With heavy soils, and when farmers can afford to apply only moderate amounts of lime, the danger is negligible. But on sandy soils (low in organic matter and therefore lightly buffered) it is easy to injure certain crops, even with a relatively moderate