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USE OF CHEMICAL AMENDMENTS TO IMPROVE CHEMICAL PROPERTIES OF SOIL

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Soils should be in good condition, both physically and chemically, to provide for optimum growth of plants. Many soils are unsuited for this purpose and need amending to improve these properties. Soil amendments are the materials added to the soil for the purpose of making soils better suited for plant growth.

Chemical Properties

The chemical properties of soil are: pH—the acidity or alkalinity of the soil; Cation and anion exchange capacity—the ability of the soil to adsorb and release plant nutrients (and other ions); buffer capacity—the ability of the soil to resist rapid changes in its chemical properties, especially pH, buffer capacity is one aspect of the exchange capacity of the soil; fixation of plant nutrients—tendency of the soil to convert plant nutrients to forms less available for plant use; and salinity—the level of soluble salts in the soil. These properties of the soil are very important in their effect upon the need for, and effectiveness of, added fertilizers. They are important, also, in providing the proper environment for plant growth.

Why Improve Chemical Properties?

Optimum plant growth depends upon an adequate supply of plant nutrients. Soil reaction or pH effects the form and or availability of plant nutrients in the soil and the ease with which plants may obtain the needed nutrients. It is generally accepted that plants have optimum pH ranges at which they make their best growth. Plants may still grow at pH levels above or below this optimum, however the effectiveness of added plant nutrients and plant growth may be reduced. The pH has a strong influence on the amount of anion and cation exchange capacity in some soils in Hawaii.

The exchange capacity of soils is important because many plant nutrients are absorbed and held in the exchangeable form until utilized by plants. This reduces losses due to leaching and increases the efficiency of many applied fertilizer materials. Exchange capacity also determines the buffer capacity of the soil. The amount and type of exchange capacity in Hawaii depends upon the clay mineralogy, amount of clay, pH, and humus content of the soil.

Buffer capacity is important as it prevents rapid changes in soil pH and other chemical properties of the soil. This reduces the danger of over liming when changing soil reaction or pH, and also too rapid change in plant environment.

Fixation of plant nutrients is generally considered as an undesirable characteristic of the soil because it reduces the effectiveness of added fertilizers, however, once the necessary plant nutrient is added to satisfy the fixing capacity of the soil, as for phosphorus, the plant nutrient may then be available for several cropping cycles. Fixation of plant nutrients, such as phosphorus, is due to soil mineralogy and, to a lesser extent, pH. The effect of unfavorable pH can be reduced by adjusting pH to the optimum range for the plant to be grown.

Salinity is considered to be an undesirable chemical property of the soil. It is due to an excess of soluble salts in the soil which causes poor and spotty germination of seeds, difficulty in establishing seedlings and "burns" plant tissue. This reduces yield and or quality of plant growth and may result in death of the plant if the salts are not removed.

How To Improve Chemical Properties

Perhaps the most effective way to change the chemical properties of soils is to remove the old soil and replace it with soil containing the desired characteristics. This may be impractical but soil can be amended to produce more desirable characteristics. The addition of organic matter, lime or sulfur, fertilizer materials containing plant nutrients, and where needed clay materials, are means of improving the chemical properties of soils. Adjusting soil

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pH is probably the practice that most of us are familiar with. Salinity is reduced in soils by leaching or removal of the soluble salts. Dilution of the salts by addition of uncontaminated soil material, organic matter, etc., is another way of reducing salinity in soils.

What to Use to Improve Chemical Properties

Organic matter may be added to the soil by the use of peat moss, sawdust, compost, animal manures, and similar materials. The added organic matter must undergo decomposition to humus before it will affect exchange capacity, buffer capacity and leaching. Decomposition of the high carbon-low nitrogen materials, such as leaves, sawdust, etc. is hastened by the addition of one cupful of ammonium sulfate, or its equivalent, for each bushel of material added to the soil. This extra nitrogen reduces the danger of nitrogen deficiency, for the crop plants, when the carbonaceous materials are added to the soil. The organic material added should be uniformly mixed with the soil and be not more than one-half by volume of the total mixture, one-third is probably better for most soils.

Animal manures contain varying amounts of plant nutrients depending upon the kind and age of the animal, how the material has been handled, etc. These nutrients may become available for plant use. Most manures in Hawaii contain soluble salts so may increase the salinity problem. When adding manures, allow equilibration with the soil for two weeks or more before planting crops.

Soil reaction or pH is adjusted by adding lime to the soil if too acid or sulfur when too alkaline. Lime is any form of calcium and magnesium added to the soil to change the pH. The most common form of lime in Hawaii is ground coral or Ag limestone. The most common form of sulfur is flour of sulfur. The amount of these amendments to use depends upon the kind of soil, the original pH and the desired pH, the form of lime or sulfur used, the amount and type of clay and the amount of humus in the soil.

To determine the amount of lime or sulfur to use have your soil tested. Your County Agricultural Agent can assist you in having your soil tested.

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