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INTERPRETING YOUR SOIL TESTING RESULTS (Part II)

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Now that you have your soil test results in your hand, what do they mean and how can they benefit you? Soil test results will give you a good indication of your soil fertility. This publication describes the soil report form and defines the terms found on the form.

WHAT IS A SOIL TEST?

A soil test is a scientific method for obtaining information about the fertility level of a soil. Soil samples are analyzed by chemical means to determine soil reaction (pH), organic matter, soluble salts, nitrogen, phosphorus, potassium, calcium, magnesium, sodium, sulfur, copper, zinc, iron, and manganese contents. Results along with information about the soil, cropping history and treatment are used to determine fertilizer and other soil amendments needed to meet the plant nutrient requirements of each individual crop.

VALUE OF SOIL TEST RESULTS

Individual soil test results serve as a basis for proper and profitable fertilization. Over a period of time under intense cultivation (3 years for field crops, 2 years for vegetables. and 5 years for ornamental crops) it will be necessary to retest the fertility of your soil. Sampling and testing procedures will be identical but interpretation of the results will be more accurate. Results from soil tests performed after the original soil test along with records of all soil amendments made since the original soil sample was collected, will give an accurate account of the effect that you and your crops have had on the soil in that time between sample collections. With this information, soil amendments can be added with even greater accuracy than with the single soil test results.

Fertilizer only insures high yields when other conditions affecting crop yields are favorable. A good stand, adequate moisture, control of insects, diseases, and weeds, as well as good physical condition of the soil are important in obtaining profitable returns from money invested in fertilizers.

REPORTING RESULTS OF SOIL TESTS

At this point, it is important to consider the soil report form. The nutrient level of each soil is rated “Below”, “Optimum”, or "Above.” The dotted line in the “Below” region indicates the critical level at which the nutrient could seriously weaken or limit plant growth. If the nutrient is below critical level, a definite plant response would be expected by adding the element either in the form of organic or chemical fertilizer. When the nutrient level falls in the “Optimum” region the nutrient is sufficient to allow for optimum plant growth. For most crops, a complete fertilizer such as (10, 10, 10) is recommended to maintain optimum levels of nitrogen, phosphorus, and potassium in the soil, since these elements are needed in relatively large amounts by the plant. If the nutrient levels falls in the "Above” region, no additions of the nutrient are recommended and problems might result due to toxic quantities of the element or because of the imbalance of other nutrients relative to this one. To rid the soil of a toxic element, it is either recommended to leach the soil with large quantities of cistern or rain water, or to add an element to replace the toxic element on the exchange sites of the soil.

DESCRIPTION OF TERMS ON THE SOIL REPORT FORM

Table 1 defines the various terms and units found on the Soil Report Form. How do these terms indicate soil fertility? This section discusses the relevance of these terms and their importance in understanding the status of your soil.

Table 1. Terms on the Soil Report Form

pH	indicates whether the soil is acid or alkaline. 7.0 indicates a neutral reaction; less than 7.0 is acid and greater than 7.0 is alkaline.
OM.	Organic Matter. The organic fraction of the soil that includes plant and animal residues at various stages of decomposition.
ppm	parts per million
Sol. Salts	salinity or the amount of soluble salts in a soil as expressed in ppm.
meq./100ml.	milliequivalent per 100 milliliter of soil.
Act.C.E.C.	Active Cation Exchange Capacity. C.E.C. of 0-15 - indicates a sandy soil C.E.C. of 15-25 - indicates a loam soil C.E.C. above 25-indicates a clay soil

The soil reaction (pH) given on the report form indicates whether the soil is acid or alkaline. A pH of 7.0 indicates a neutral reaction, whereas less than 7.0 is acid and greater than 7.0 is alkaline. Most field crops grow satisfactorily in the range from 5.5 to 8.3. The pH measurement is the single most informative reading on the soil test report form. It indicates which nutrients might be unavailable due to the formation of insoluble compounds. For example, at relatively alkaline pH*s (above 8.0), the micronutrients iron (Fe), zinc (Zn), manganese (Mn), and copper (Cu) are fixed and the plant is unable to extract them from the soil. In this case, corrective measures might be achieved more readily by applying foliar sprays of these trace metals directly to the foliage instead of application to the soil. At this pH, applying these elements directly to the soil would result in the formation of insoluble compounds that plant roots cannot extract.

As the pH is lowered (by addition of sulfur or other acid forming materials), these micronutrients (Fe, Zn, Mn, Cu) would become more soluble and therefore available to the plant. In areas where acid soils dominate, limestone ($CaCO_3$) is often added to raise the pH. However, in the Virgin Islands, alkaline soils dominate and therefore sulfur is added to neutralize the soil and help bring trace elements into the optimum region.

Organic matter is a very good indicator of the fertility of soil. Tropical regions tend to be relatively low in organic matter because of rapid breakdown due to high temperatures and humidity. Most arable soils have organic matter ranging from 2-8%. Organic matter levels below 2% indicate the need to add manure, compost, or grow a green manure crop, such as perennial soybeans, and plough it under. Organic matter is of crucial importance in supplying nitrogen, phosphorus, and sulfur to the plant.

The level of soluble salts can be an important factor in the fertility of your soil. This is particularly true where irrigation is practiced or in areas close to the ocean. Soluble salts indicate the salt level of the soil. Levels above 1400 ppm are considered problems. Plants differ in their tolerance to salt, so that plants such as coconuts thrive at salt levels that would injure plants such as beans.

Not only must nutrients be at adequate levels to grow healthy crops, but the levels must be balanced in regard to each other. An imbalance in the calcium to magnesium ratio (Ca/Mg) or the magnesium to potassium ratio (Mg/K) would result in significant reductions in yield. These ratios are as important as the individual levels of nutrients and for this reason they are included on the report form.

The remaining terms on the soil report form are the elements essential in crop production. These elements are listed in Table II along with their function and deficiency symptoms.

WHERE TO SEND SOIL SAMPLES

Soil samples are tested at the Cooperative Extension Service, St. Thomas campus of the College of the Virgin Islands in the New House Building. Soil samples may be taken to the Extension office on St. Croix where they will be sent to St. Thomas for analysis. Drying, processing, testing, interpretation and return of results normally require a minimum of 15 to 25 days to complete. There is no charge for this service to V.I. residents at present. For more information call 774-0210 or 778-0246.

Table 2. Elements Diagnosed by the Soil Testing Laboratory

Element	Function	Deficiency symptoms
Nitrogen	Indispensable constituent of amino acids and proteins. Provides for leafy, green growth.	General yellowing of leaves and slow growth, occurring in older leaves first.
Phosphorous	Essential for energy transfer and fruit and seed formation.	Dark blue-green leaves possibly with red or purple veins. Slow growth. Appears in older leaves.
Potassium	Helps resist drought and lodging. Activates enzyme systems.	Margins of lower leaves appear yellow and may develop brown spots. Slow growth.
Sulfur	Essential component in some amino acids, also present in enzymes, vitamins, and other essential organic compounds.	Yellow, chlorotic leaves. Appears in lower leaves first. Resembles nitrogen deficiency.
Calcium	Important in cell elongation and cell division.	Failure of terminal buds to develop.
Magnesium	Part of chlorophyll molecule necessary for photosynthesis.	Yellow blotching beginning at tips of leaf and on lower leaves first
Boron	Essential for proper cell development and normal growth, flowering, and quality.	Cessation of growth of terminal bud, followed by younger leaves turning pale green at the base (rather than the tip).
Iron	Indispensable for chlorophyll synthesis. Component of enzymes and carriers operating in the respiratory system.	General yellowing, appearing first in younger leaves. Leaf tissue between veins turns yellow while veins remain green.
Zinc	Involved in enzymatic activity, chlorophyll synthesis, carbohydrate transformations, and growth promoting substances.	Small yellow leaves that may turn brown and drop.
Manganese	Associated with chlorophyll synthesis, nitrogen metabolism and carbohydrate breakdown.	General chlorosis of young leaves between the veins. Often gray spots or streak on leaves and upper system.

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