OAHU MASTER GARDENER
COOPERATIVE EXTENSION SERVICE

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How to Interpret a Standard CTAHR Soil Analysis Report*

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CTAHR Soil Analysis Report

CTAHR's soil analysis report shows the available amounts of various plant nutrients that were present in your soil at the time of sampling. The soil test report is an index of the chemical aspect of soil fertility, and therefore tells only part of the story. It is a valuable diagnostic tool, but it cannot *alone* tell you the correct way to manage your soil.

Hawaii Soils

Soils of Hawaii are divided into three main groups *for soil analysis purposes*:

- **Heavy soils** developed from alluvial or volcanic rocks
- **Light soils** developed from volcanic ash
- **A'a lava land**, predominantly composed of broken lava rocks mixed with some fine soil particles and organic matter

Sample CTAHR Soil Analysis Report

CTAHR
College of Tropical Agriculture & Human Resources
University of Hawaii at Manoa

Soil/Plant Analysis Report

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Sample Information

Job Control No:	02-028852-003	Map Unit:		Plant Grown:	None
Sample Label:	NOT-PLANTED	Soil Series:		Plant to be grown:	VEGETABLES
Date Received:	07/31/1901	Soil Category:	HEAVY SOIL	Can you till 4~6 in.?	No
Send Copy To		Soil Depth (in):		Test Results Only?	No
Elevation (ft.):		Latitude:		Longitude:	

Test Results and Interpretation

HEAVY SOIL			INTERPRETATION				
Soil Analysis	Results	Expected	Very Low	Low	Sufficient	High	Very High
_pH	6.7	6					
P_ppm	205	37.5					
K_ppm	336	250					
Ca_ppm	2496	1250					
Mg_ppm	232	350					
OC_%		No criteria found					
Total_N_%		No criteria found					
Salinity_EC		1.5					

(Source: http://www.ctahr.hawaii.edu/DeenikJ/Downloads/Training/ Nutrient_Mgmt_Fertilizer_Recommendations.pdf)

***** This handout only covers a standard soil analysis report containing pH, salinity and Ca, Mg, P, K extractable nutrients. Extractable nutrients are those that are removed from the soil and measured during

laboratory analyses. The extractant solutions may remove more or less of a nutrient than is actually available to a plant, so measurements of extractable nutrients are only a "best estimate" of the levels of nutrient that a plant's roots can absorb.

Interpreting the Soil Analysis Report (From Chapter 7 of CTAHR's Plant Nutrient Management in Hawaii's Soils)

Soil analysis levels generally considered adequate for three main soil groups:

Soil property	Unit	Heavy soils	Light soils	A'a land
Acidity	pH	5.8 – 6.2	5.8 – 6.2	5.5 – 6.2
Phosphorus	P (ppm)	25 – 35	50 – 85	80 – 100
Potassium	K (ppm)	200 – 300	200 – 400	400 – 600
Calcium	Ca (ppm)	1500 – 2000	3000 – 4000	1500 – 2000
Magnesium	Mg (ppm)	300 – 400	600 – 800	300 – 400
Salinity	EC (mmhos/cm)	< 3.0	< 3.0	

Note: CTAHR reports each nutrient in parts per million (ppm). These numbers represent an approximation of the *plant available* nutrients present, not the total amount of each element (P, K, Ca, etc) in the soil.

Conditions and actions indicated by levels of pH and nutrients in a standard soil test:

Very low: Your former fertilizer program was inadequate; you need both to add nutrients and change the fertilizer program.

Low Soil pH: Low pH has many adverse effects including toxicities as well as low amounts of Ca and Mg.
Low Phosphorous (P): Soil P levels are inadequate; P fertilizer is needed.
Low Potassium (K): Soil K is too low for most plants; K fertilizer is needed; perhaps K is leaching (too much water?)
Low Calcium (Ca): Soil Ca is too low for most plants; liming is the low-cost alternative
Low Magnesium (Mg): Soil Mg is too low for most plants; Mg needed either as Mg sulfate or dolomite, depending on soil pH

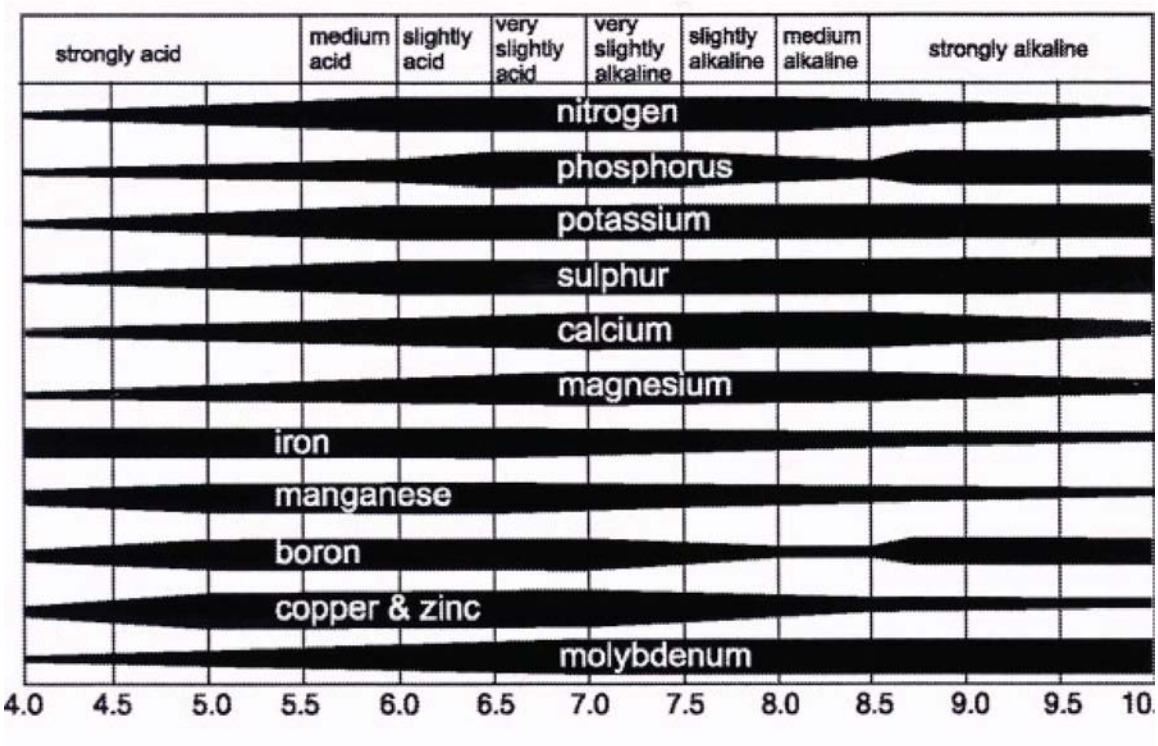
Sufficient: No need for additional fertilization

High: Levels are higher than desired, but not likely to be a problem

Very high Soil pH: Soil pH is too high and could result in micronutrient deficiencies, low P and other nutrient imbalances; the liming program should be revised
Very high Phosphorus (P): Soil P is too high; too much P has been added, which could lead to micronutrient deficiencies; environmental contamination could result; the fertilizer program should be revised
Very high Potassium (K): Soil K is too high; this could lead to nutrient imbalances, especially with Mg; the fertilizer program should be revised
Very high Calcium (Ca): Be prepared fro problems such as nutrient imbalances, particularly micronutrient problems; the fertilizer program should be revised
Very high Magnesium (Mg): Soil Mg is too high; in some cases, Ca/MG ratios less than 1 can be detrimental; the fertilizer program should be revised

Influence of Soil pH on Nutrient Availability

Soil pH is one of the most important soil properties that affect the availability of nutrients. Macronutrients tend to be less available in soils with low pH. Micronutrients tend to be less available in soils with high pH. Lime can be added to the soil to make it less sour (acid) and also supplies calcium and magnesium for plants to use. Lime also raises the pH to the desired range of 6.0 to 6.5. In this pH range, nutrients are more readily available to plants, and microbial populations in the soil increase. Microbes convert nitrogen and sulfur to forms that plants can use. Lime also enhances the physical properties of the soil that promote water and air movement.



(Source: http://www.fao.org/docrep/008/ae939e/ae939e0f.jpg)

A pH of 7.0 is neutral; 6.0 is mildly acid, 5.0 is strongly acid, and 4 is extremely acid, while numbers above 7 indicate alkaline soil. Most Hawaii soils have a pH ranging from 4 to 9.

Fertilizer Recommendations

Sample CTAHR Fertilizer Recommendation Table

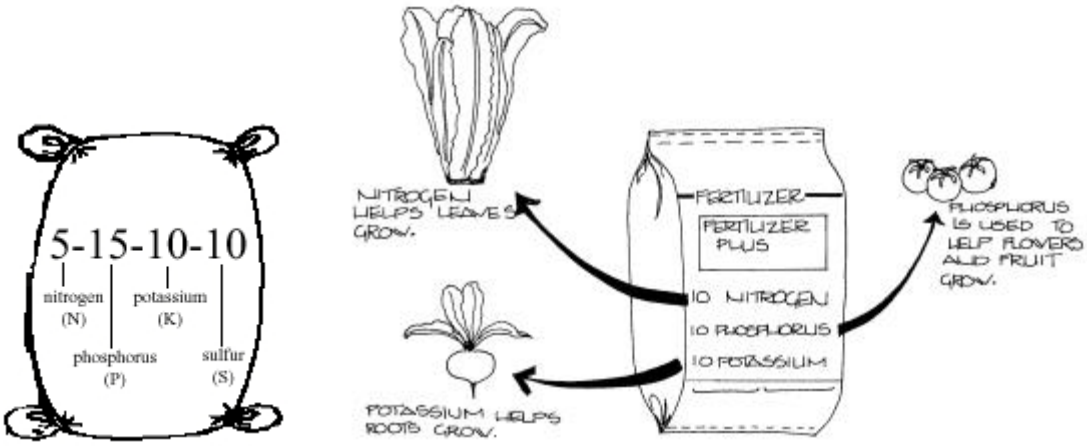
Total nutrient requirement (lbs/A):		Nitrogen(N):	Phosphorus(P):	Potassium (K):
Fertilizer/Material Options		Fertilizer Amount		Est. Cost
		lbs/1000sq.ft./Crop	lbs/1000sq. ft./mo.	$/1000sq. ft.
Lime				
Fertilizer selection				

Micronutrient				
Other Fertilizers				
Comments:				

(Source: http://www.ctahr.hawaii.edu/TPSS/research_extension/rxsoil/soilsample.htm)

Fertilizer recommendations for your garden or field include amounts of lime (in either lbs/1000 sq. ft. or tons/acre), estimated cost, fertilizer type (e.g., 21-0-0, 21-0-32, 10-30-10), amount and cost. If you want to convert inorganic fertilizer recommendations to an organic one, go to http://pubs.caes.uga.edu/caespubs/pubcd/C853/C853.htm.

Fertilizers Opinions vary concerning the merits of manures or other organic fertilizers versus "chemical" fertilizers. Excellent gardens may be grown using either method. Plants do not differentiate between nutrients from organic and chemical fertilizers; the form absorbed by plant roots from both sources is identical. Plants can use chemical fertilizers as soon as they are applied. Soil bacteria and fungi must act on most organic nutrient sources to change them into a usable form. Thus, if you use mostly organic fertilizers, you may need to add a small amount of a source of more readily available nitrogen early in the season to ensure adequate plant nutrition until the organic sources become available to plants. Options include liquid fish, blood meal, and chemical fertilizer. Both chemical and organic fertilizers are available as packaged mixes containing N, P, K. Fertilizer package labels tell how much of each nutrient the fertilizer contains.



(Source: http://extension.oregonstate.edu/catalog/html/ec/ec1503/#anchor1456653 and http://www.hort.vt.edu/HORT6004/network/YouthGardener/Helpsheets/fertilizing.pdf)

The nutrients always are listed in this order on the label: nitrogen-phosphorus-potassium. Thus, a fertilizer labeled 5-15-10 contains 5 percent nitrogen, 15 percent phosphorus (in the form of phosphate P2O5), and 10 percent potassium (in the form of potash K2O). In other words, every 10 pounds of this fertilizer material contains 0.5 pound nitrogen, 1.5 pounds phosphorus, and 1 pound potassium (10 lb material x 0.05 N = 0.5 lb N). If a fourth number is listed, it represents sulfur. Thus, a 5-15-10-10 fertilizer also contains a 10-percent concentration of sulfur (in the form of sulfate). The remaining components of the fertilizer material include carbon, hydrogen, oxygen, and coating materials.