UNDERSTANDING AND INTERPRETING YOUR SOIL ANALYSIS REPORT

All analyses and recommendations are based on the sample as submitted to the laboratory and the accompanying information. We assume that a soil sample accurately represents the soil and crop conditions in the field or the area that has been sampled. We assume a standard surface sample depth of 8 inches, unless specified differently. All fertilizer application rates are recommended as "actual nutrient" or "pounds of plant food", so must be adjusted for the analysis of the particular fertilizer material or soil amendment to be used. It may also be necessary to modify or adjust the calculated fertilizer recommendations to fit individual financial circumstances, land tenure issues, or other conditions.

SOIL PROPERTIES

Soil pH is a measurement of the acidity or alkalinity in the soil water. The pH affects soil nutrient chemistry, root growth, and other processes.

Soil pH	General rating
< 5.4	Strongly acid
5.4 – 5.7	Moderately acid
5.8 – 6.4	Slightly acid
6.5 – 7.2	Neutral
7.3 – 7.5	Slightly alkaline
7.6 – 7.8	Moderately alkaline
> 7.8	Strongly alkaline

Buffer pH is a second measurement that is triggered when the soil pH is 6.2 or lower. It is used only to calculate the amount of liming material required to neutralize soil acidity for the next three to five years after application. Liming material rates are given as tons per acre of effective calcium carbonate (ECC lime) needed to adjust the soil pH to 6.0, 6.5, or 7.0. Field application rates must be adjusted for the quality of the liming material to be applied.

Soluble salts are a measurement used to estimate the total ion content (or "dissolved minerals") found in the soil water. Levels above the moderate range suggest a potential for soil salinity to affect growth of various crops and plants. Additional tests are needed to diagnose specific soil salinity problems.

Soluble salts, mmho/cm	General rating
< 0.2	Very low
0.3 – 0.7	Low
0.8 – 1.2	Moderate
1.3 – 2.5	Moderately high
2.6 – 5.0	High
> 5.0	Very high

Excess lime is a rating of the potentially reactive carbonates in the soil. The rating is expressed as "NO", "LO", or "HI" for the relative amount of visible effervescence (or "fizzing") that might be observed when using dilute acid on the sample. High excess lime often indicates potential for iron deficiency chlorosis and other nutrient management concerns.

Organic matter (% OM) is a measure of the percentage of total carbon-containing materials in a soil sample. Soil organic matter is considered to average 58% carbon. The organic matter content may affect certain herbicide application rates and may affect fertilizer rate recommendations for nitrogen or sulfur.

Cation exchange capacity (CEC) is the capacity of the soil to hold positively charged ions ("cations") on soil particle surfaces. Cation exchange capacity is affected by the soil clay and organic matter content, so CEC can be considered a generalized indicator of soil texture. CEC is calculated from the analysis results of potassium (K), calcium (Ca), magnesium (Mg), sodium (Na), and buffer pH (H). If excess lime is "HI", the CEC value may be artificially inflated and overestimate the clay content. "Base saturation" is calculated by subtracting the sum of %K, %Ca, %Mg, and %Na from 100%.

CEC, meq/100g	Typical texture
< 6	Very sandy soils
5 - 12	Sandy soils
10 - 25	Loamy soils
20 - 40	Clayey soils
35 - 50	Clay soils

Exchangeable sodium (as % Na) may indicate potential for soil structure breakdown and water percolation problems.

% Na	Sodium hazard
< 2	Very low
3 - 5	Low
6 - 9	Moderate
10 - 15	High
> 15	Severe

MOBILE NUTRIENTS

Nitrogen fertilizer recommendations depend on the individual crop, yield goal, and available nitrogen credits. Each crop has its own specific nitrogen requirement, multiplied by the yield goal to establish a crop nitrogen requirement for the growing season that follows sampling. Recommended fertilizer rates can be calculated by subtracting nitrogen credits from the annual crop requirement. Rates may also be adjusted with credits for surface soil nitrogen, subsoil nitrogen, organic matter, manure, and/or previous legume crops. Nitrate (NO_3-N), the mobile form of nitrogen, is primarily used to identify plant-available soil nitrogen. Soil nitrogen content is calculated as:

lb N/ac = ppm NO_3-N * sample depth increment, inches * 0.3

"Sample depth increment" is the depth from the top to the bottom of the sample. For example, a surface soil sample with an 8-inch depth increment begins at the "top" (or the soil surface at zero inches) extending downward to include the soil at a maximum depth of 8 inches. An 8-to-24-inch subsoil sample is collected to include soil from 8 inches below the surface ("top") to 24 inches below the surface ("bottom") and has a sample depth increment of 16 inches. "0.3" is a density factor that converts the nitrate concentration to pounds per acre.

Sulfur fertilizer rate recommendations are calculated by considering the annual crop requirement, yield goal, soil test sulfur, organic matter percentage, and soil texture (as indicated by CEC). Sulfur fertilizer is only recommended for a single growing season.

IMMOBILE NUTRIENTS

The results for phosphorus (P), potassium (K), zinc (Zn), and other nutrient results are expressed as "parts per million" or "ppm". These results do not measure the total per acre quantity of nutrient, but are a short-term chemical extraction used to estimate the potential capacity of the sampled soil to supply the nutrient of interest to the root system of a specific crop or plant throughout the entire growing season.

Fertilizer recommendations for phosphorus and potassium are based on nutrient sufficiency levels developed from field research. The soil analysis result indicates the probability that proper application of a fertilizer nutrient will improve yield. The general approach for phosphorus and potassium is to recommend enough fertilizer to meet the current crop needs for 100% sufficiency plus an amount to gradually build the soil test to an optimum level over five to seven years, then to maintain the soil test in the optimum range. Nutrient deficiency is not expected to limit yield when the soil analysis shows the nutrient is in or above the optimum range.

The recommended rates for zinc and other micronutrients are recommended as a one-time, broadcast application to raise the soil test to the optimum level for the following three to five years, which could then be followed by another broadcast application to bring the soil test back to the optimum level. The initial single application could also be followed by smaller, annual applications to maintain the soil test in the optimum level.

The ranges in the following table should be considered as general guidelines for a wide range of field situations. The particular range may differ for individual crops or the range may be affected by a soil characteristic, like pH or texture.

Soil test result ratings * *(based on 8-inch surface sample depth increment)*			**General category**					
			Very low	**Low**	**Medium**	**Optimum**	**High**	**Very high**
			Probability of yield response to applied fertilizer					
Analysis	***Extraction method***	***Detection method***	*Very likely*	*Likely*	*Somewhat likely*	*Unlikely*	*Not expected*	
Nitrate, ppm NO_3-N **	*KCl*	*Cd reduction*	<5	5 - 10	10 - 25	---***	25 - 50	> 50
Phosphorus, ppm P	*Mehlich-3*	*colorimetric*	< 6	6 - 14	14 - 25	25 - 35	35 - 50	> 50
	Olsen bicarbonate	*colorimetric*	<3	3 - 6	6 - 11	11 - 16	16 - 20	>20
	Mehlich-3	*ICP*	< 7	7 - 15	15 - 26	26 - 37	37 - 50	> 50
	Bray-1	*colorimetric*	< 5	5 - 12	12 - 23	23 - 33	33 - 50	> 50
Potassium, ppm K	*Am. Acetate / Mehlich-3*	*ICP*	< 60	60 - 120	120 - 160	160 - 220	220 - 280	> 280
Calcium, ppm Ca	*Am. Acetate / Mehlich-3*	*ICP*	< 100	100 - 200	200 - 300	300 - 2000	2000 - 4000	> 4000
Magnesium, ppm Mg	*Am. Acetate / Mehlich-3*	*ICP*	<25	25 - 50	50 - 75	75 - 100	100 - 200	> 200
Sulfur, ppm S **	*Am. Acetate / Mehlich-3*	*ICP*	< 2	2 - 5	5 - 10	---***	10 - 15	> 15
Zinc, ppm Zn	*DTPA*	*ICP*	< 0.3	0.3 - 0.5	0.5 – 0.8	0.8– 1.2	1.2 – 2.0	> 2.0
	Mehlich-3	*ICP*	<0.9	0.9– 1.2	1.2 – 1.7	1.7 – 2.4	2.4 – 3.7	> 3.7
Iron, ppm Fe	*DTPA*	*ICP*	< 1.0	1.0 – 2.5	2.5 – 5.0	5.0 – 15	15 - 30	> 30
	Mehlich-3	*ICP*	< 60	60 - 65	65 - 75	75 - 100	100 – 140	> 140
Copper, ppm Cu	*DTPA / Mehlich-3*	*ICP*	< 0.1	0.1 – 0.2	0.2 – 0.5	0.5 – 0.9	0.9 – 1.5	> 1.5
Manganese, ppm Mn	*DTPA*	*ICP*	< 0.5	0.5 – 1.0	1 – 3	3 – 6	6 - 10	> 10
	Mehlich-3	*ICP*	< 5	5 - 10	10 - 25	25 – 120	120 - 180	> 180
Boron, ppm B	*DTPA-sorbitol*	*ICP*	<0.1	0.1 - 0.3	0. 3 – 0.5	0.5 – 1.0	1.0 – 1.7	> 1.7
	Mehlich-3	*ICP*	<0.7	0.7 – 1.0	1.0 – 1.5	1.5 – 2.7	2.7 – 4.5	> 4.5
	Hot Water Soluble	*ICP*	< 0.2	0.2 – 0.5	0.5 – 0.8	0.8 – 1.5	1.5 – 2.5	> 2.5

These ranges are provided for general crop production situations. The ranges may be different for individual crops, particular yield objectives, or for specific soil situations.

***** Ranges for mobile nutrients (NO_3-N, S) are based on survey results. They are not based on sufficiency or probability of yield response.***

****** The optimum range for mobile nutrients (NO_3-N, S) depends on the projected yield goal and other factors which are very specific to the crop and field situation.***

ICP = inductively coupled argon plasma; Am. Acetate = ammonium acetate

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