



PEI Analytical Laboratories
Soil Testing

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How to Interpret Your Soil Test Report

Introduction

Your soil test report includes four important sets of information:

1. The actual *soil test values* of the available amounts of plant nutrients in the soil.
2. The *soil ratings* of the available amounts of plant nutrients.
3. The *suggested applications* of fertilizer and limestone.
4. Auxiliary soil test information on soil cation exchange capacity (CEC), % base saturation and suggested adjustments in fertilizer requirements for management factors such as manure applications and sod plowed down.

The suggested applications of fertilizer have been determined from the actual soil test values and the soil ratings. The suggested applications of fertilizer are based on Atlantic Canada soil fertility research and should provide adequate plant nutrition to produce good economic yields most years. However, remember that *soil test results can be no better than the samples taken and can only represent the samples taken*. For a detailed explanation of the proper methodology on how to soil sample, refer to the factsheet “The Why and How of Soil Sampling” on the PEI Analytical Laboratory website.

The following is a brief explanation of the actual soil test values, soil ratings, and the suggested limestone and fertilizer applications, in the order that they appear on the *Soil Analysis Report Form*.

An Explanation of Your Soil Test Analysis Results

Organic Matter: This is the amount of organic matter in your soil sample on a percent basis. Soil Organic Matter plays an important role in maintaining plant nutrients in the soil and soil structure. Soil Organic Matter improves soil aggregation, drainage, aeration, CEC and influences pesticide activity in the soil.

pH: This is the actual soil pH as determined using a soil/distilled water mixture in the lab. A soil pH of 7.0 is considered neutral. A soil pH of less than 7.0 is considered acidic and a soil pH of less than 5.0 is considered very acidic. In PEI, most soils are in the acidic pH range. Potatoes grow well at a soil pH range of 5.5 to 6.0, depending on the scab resistance of the potato variety. Growth of field crops grown in rotation with potatoes may be better at a greater pH (i.e. pH of 6.0-6.5), as the availability of most nutrients within the soil is favorable within this pH range.

Phosphate, Potash, Calcium and Magnesium: These show the available amounts of the plant nutrients phosphate (P_2O_5), potash (K_2O), calcium (Ca) and magnesium (Mg) in your soil sample in parts per million (ppm). Beside each value are the *soil ratings*. The soil ratings show how the actual soil test values of your soil sample compare to a highly fertile soil. The range of soil ratings used to indicate high, medium and low fertility are: H+, H, M+, M, L and L-. At any particular soil test value, the soil rating may differ between crops because different crops have different ranges of nutrient demands.

Boron, Copper, Zinc, Sulphur, Manganese and Iron: These show the available amounts of the plant nutrients boron, copper, zinc, sulphur, manganese and iron in your soil sample in the units, ppm. The range of soil ratings used to indicate high, medium and low fertility are: H+, H, M+, M, L and L-.

Sodium: This shows the amount of sodium in your soil sample in ppm. Sodium is not usually considered an element that is essential as a plant nutrient, nor is it necessary for normal plant growth. The sodium analysis of your soil sample is used as part of the calculation of the % base saturation and Cation Exchange Capacity (CEC) value shown in the bottom section of your soil test report.

Lime Index: The Lime Index value together with the soil pH is used to determine the lime requirement of your soil. The Lime Index is determined in the laboratory by mixing an SMP buffer solution with your soil and then measuring the pH. The Lime Index value is sometimes also known as the 'buffer pH' value. This value indicates the buffering capacity of your soil when exposed to liming agents. The higher the Lime index value in comparison to its water pH, means the easier the ability of the lime to raise the soil sample's pH. A small change in the buffer pH would require more lime to change the soil pH, as this soil would have greater resistance to liming due to the greater amount of reserve soil acidity within this sample. The suggested applications of lime for your soil are listed in the next section of your soil test report, and reflect the Lime Index value as described.

Conductivity: This is a measure of the salinity of the soil in your soil sample measured in the units of milliSiemens/cm (mS/cm). Germination of seeds may be delayed or prevented, plant growth may be poor, or plants may be killed in a soil with a high salt content. A salt value of 0.0 to 0.45 is tolerated by most plants as long as excessive amounts of fertilizer are not used. Salt values of 0.46 to 1.0 may reduce seed emergence or cause damage to plants, whereas salt values over 1.0 are likely to cause damage to most plants.

An explanation of your suggested fertilizer and limestone applications

Suggested applications of limestone: There are three suggested applications of limestone for your soil given in the units, T/ha. The suggested applications of lime required to reach the soil pH of 5.5, 6.0 and 6.5 are listed. You must choose the soil pH you wish to achieve in order to select your suggested limestone application from these three choices. The final pH you wish to achieve will depend on your cropping program. For example, potatoes grow well at a soil pH range of 5.5 to 6.0, depending on the scab resistance of the potato variety. Growth of field crops grown in rotation with potatoes may be better at a pH greater than 5.7. Most other crops would benefit from a soil pH greater than 6.0.

There is a range of liming agents available for use. '*Pure calcite*' (CaCO_3 or calcitic limestone) is a good soil acidity neutralizing agent, and contains 40% Ca, providing a good source of Ca for plant nutrition. '*Pure dolomite*' ($\text{CaMg}(\text{CO}_3)_2$ or dolomitic limestone) is comprised of 21.7% Ca and 13.1% Mg (giving a Ca:Mg ratio of 2:1). It is a good source of both Ca and Mg for plant nutrition and effective at neutralizing soil acidity. Generally, the term '*calcitic limestone*' is used to mean a limestone with very little Mg. The terms '*dolomitic limestone*' or '*Mg limestone*' are used to mean a limestone that can vary in Mg content from 13.1% Mg to 0.6% Mg.

'*High Mg limestone*' also has a good neutralizing value, and contains approximately 5% Mg and 31% Ca, making it another good source of both Ca and Mg for plant nutrition. '*Gypsum*' (CaSO_4) is a good source of Ca and S for plant nutrition, but has little to no neutralizing value and therefore does not affect soil pH. Gypsum has varying ranges of purity and % Ca and % S contents. '*Hydra-lime*' is a mix of 10% hydrated lime, 10% gypsum, and 80% of magnesium limestone, and is a good source of Ca and Mg for plant nutrition.

Suggested applications of fertilizer: Your soil test report indicates the suggested applications of *plant nutrients* for a successful crop yield. This information is shown on the soil test report as the amounts of the nitrogen (N), phosphate (P_2O_5) and potash (K_2O) suggested, in kilograms per hectare (kg/ha). The rates of *fertilizer mixes* required to supply those plant nutrients still needs to be calculated and depends on your choice of fertilizer mix. Calculated examples of the rates of suggested *fertilizer mixes* (i.e.: 10-20-20) that would supply these plant nutrients are on the sheets. If you need help in calculating specific

fertilizer rates and mixes based on the suggested fertilizer applications, please contact the a PEIDAF Nutrient Management specialist at (902) 316-1600.

Cation exchange capacity (CEC): This is a measure of the ability of a soil to hold and exchange plant nutrient cations. It is expressed as milli-equivalents per 100 grams of soil (meq/100 g). Many plant nutrients occur in the soil as positively charged cations. The ability of a soil to hold these plant nutrient cations from being leached and lost from the soil is important in maintaining soil fertility. Clay or organic matter in the soil are negatively charged and contribute to the soil's ability to hold these nutrient cations. Soils with high clay or organic matter contents tend to have higher CEC, be more fertile and require more lime to correct pH.

%K, %Mg, %Ca, %H, %Na: These are the actual amounts of exchangeable cations in your soil, expressed in percent (%). K, Mg, and Ca are plant nutrient cations. H and Na are other cations normally present in the soil. These are used to calculate the % base saturation of your soil (see below).

% Base Saturation: This is a measure of the proportion of the total CEC (expressed in percent, %) in your soil that is occupied by Na and the "basic" nutrient cations (K, Ca, Mg). While there is no such thing as an "ideal % base saturation", these values are sometimes used to make recommendations for potash, calcium or magnesium amendments to soils. However, typically this approach fails to consider the cost and economics of such an application and does not take into account excessively high levels of cations.

Adjustments in fertilizer requirements for management factors: Any kind of manure applied to the soil adds plant nutrients. The nutrient value of any manure application you may have indicated on your sample submission form has been accounted for by the computer when calculating your fertilizer application rates by making an appropriate reduction in your fertilizer rates. This will reduce your fertilizer costs, maximize your returns from your farm operation and help prevent nitrate and phosphate leaching and runoff into streams and groundwater.

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