

# The Anatomy of a Soil Test Report

Adapted from D.D. Warncke, J. G. Dahl and M. L. Vitosh's "Understanding the MSU Soil Test Report" (2016)  
by Christine Charles and Christina Curell, Michigan State Extension Educators

## Fertilizer Recommendation Program Report

### BACKGROUND INFORMATION

DATE	FIELD ID	Soil Type	Previous Crop	Acres
2/9/2023	Home	Mineral	Corn	10.0

### SOIL TEST RESULTS

SOIL NUTRIENT LEVELS		Below Optimum	Optimum	Above Optimum
<sup>1</sup> Soil pH	6.8	Lime Index 70.0		
<sup>2</sup> Phosphorus (P)	88	ppm		
<sup>3</sup> Potassium (K)	95	ppm		
<sup>3</sup> Magnesium (Mg)	110	ppm		

**Disclaimer:** Accurate recommendations from the MSU Fertilizer Recommendation Program depend on the use of soil test values derived from compatible laboratory procedures (see [About](#) page for more information).

ADDITIONAL RESULTS:					Optional Tests:			
Calcium (Ca) (ppm)	CEC (meq/100 g)	% of Exchangeable Bases			Micronutrients (ppm)			
		K	Mg	Ca	B	Cu	Mn	Zn
1102	6.7	3.7	13.7	82.6				

### FERTILIZER RECOMMENDATIONS

RECOMMENDATIONS:								
Limestone: N	PANEL							
Target pH = 6.8	Tillage Depth: 6 inches							
	% Stand:							
Plant Nutrients:				Micronutrient: (Optional)				
Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P <sub>2</sub> O <sub>5</sub> /A)	Potassium (lb K <sub>2</sub> O/A)	Boron (lb B/A)	Manganese (lb Mn/A)	Zinc (lb Zn/A)	Copper (lb Cu/A)
Alfalfa hay	6ton	0	0	280	2.0			

### FOOTNOTES

**MESSAGES:**

For questions about interpreting your soil results go to the following website: <http://fieldcrop.msu.edu/uploads/files/FieldCropsPointofContactMap.pdf> and contact the MSUE agent in your area.

### BACKGROUND INFORMATION

This section contains information provided primarily by the farmer, which is important for making the correct fertilizer and lime recommendations. (Page 2)

### SOIL TESTS RESULTS

The soil test values are indicators of the relative available nutrient levels in the soil. They are correlated with plant growth and yield responses. (Page 3)

### FERTILIZER RECOMMENDATIONS

Fertilizer recommendations are based on the soil test results and crop information provided. (Page 4)

### FOOTNOTES

The footnotes are printed out in special situations to help the farmer better understand the recommendations and maximize crop production. (Page 4)

MICHIGAN STATE  
UNIVERSITY

Extension

MSU is an affirmative-action, equal-opportunity employer. Michigan State University Extension programs and materials are open to all without regard to race, color, national origin, gender, gender identity, religion, age, height, weight, disability, political beliefs, sexual orientation, marital status, family status or veteran status.

Michigan State University occupies the ancestral, traditional and contemporary lands of the Anishinaabeg - Three Fires Confederacy of Ojibwe, Odawa and Potawatomi peoples. The university resides on land ceded in the 1819 Treaty of Saginaw.



## THE BACKGROUND

& suggestions on information to include before submitting samples

### Fertilizer Recommendation Program Report

DATE	FIELD ID	Soil Type	Previous Crop	Acres
2/9/2023	Home	Mineral	Corn	10.0

↑

**Date:** The date your samples were run by the lab

↑

**Lab # or Sample #:** The identification number or code for the sample sent. Use this number when asking question to the lab.

↑

**Acres:** The number of acres represented by the soil sample.

The background information is already provided by the farmer before submitting samples. Consider providing the following information if possible when sending your samples to receive helpful footnotes and accurate fertilizer recommendations when getting test results back:

**Plow Depth** - the depth (inches) to which limestone will be incorporated if lime is needed. Listing the wrong depth could result in too much or too little lime being recommended. If information on "plow depth" is not given, 9 inches is used to determine the lime requirement.

- When lime is spread and incorporated with a moldboard plow, the depth indicated should be the depth of plowing.
- When the lime will be incorporated with a disk, chisel plow or similar equipment, indicate "plow depth" as only one-half of the implement's working depth in the field. That's because such tillage tools effectively incorporate surface broadcast materials to only one-half the depth of tillage.
- For no-till systems, list two inches as the "plow depth" since limestone is not incorporated and will not appreciably alter the soil pH at depths greater than two inches. Where continuous no-till is being used for crop production, a second soil sample should be taken to a two-inch depth for determining pH changes near the surface and the appropriate lime need.

**Previous Crop** - the last crop which was grown in the field. When beans, alfalfa, or clover is the previous crop, a nitrogen credit is given. The nitrogen credit equals  $[40 + (.60 \text{ times percent stand})]$  where over 5 to 6 plants/square foot in an established field is a 100 percent stand. If percent stand is not indicated, 70 percent is assumed and a nitrogen credit of 80 lb/acre [e.g.  $40 + (.6 \times 70)$ ] is given. The nitrogen credit is reflected in the printed nitrogen recommendation.

**1st Crop: 2nd Crop** - the next two crops to be grown (in sequence) or two crop options which may be grown. Fertilizer and lime recommendations are given for each crop but apply lime only once.

**Yield Goal** - the yield which the grower seeks to attain on that field. Yield goal is best based on a five-year yield average, not a highest one year yield. When figuring the yield average over several years, do not include unusually high or low yields. If a yield is not indicated by the farmer, the computer will select an average yield for that soil management group.



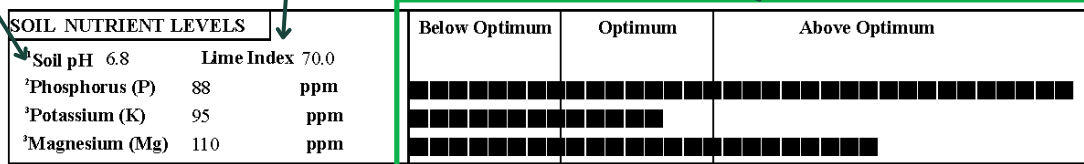
# The Anatomy a Soil Test Report

## SOIL TEST RESULTS

**Soil pH:** The current pH of the soil sample is an indication of acidity or alkalinity

**Lime Index:** An indication of reserve acidity based on current soil nutrient levels.

**Soil Test Calibrations:** This bar chart is based on research that has determined crop yield responses to different levels of soil nutrient. At below optimum conditions, yield can be improved with nutrient additions but at above optimum conditions, yield plateaus.



**Disclaimer:** Accurate recommendations from the MSU Fertilizer Recommendation Program depend on the use of soil test values derived from compatible laboratory procedures (see [About](#) page for more information).

ADDITIONAL RESULTS:				Optional Tests:				
Calcium (Ca) (ppm)	CEC (meq/100 g)	% of Exchangeable Bases			Micronutrients (ppm)			
		K	Mg	Ca	B	Cu	Mn	Zn
1102	6.7	3.7	13.7	82.6				

**CEC (Cation Exchange Capacity):** The amount of cations (positively charged nutrients) per 100g of soil that can be held or exchanged.

**% of Exchangeable Bases:** Represents the percentage of CEC occupied by positively charged nutrients or cations (Ca, Mg, K).

**Micronutrients:** Micronutrients are important for a variety of biochemical plant pathways, including stress responses.

**Organic Matter:** The percentage of your soil that is comprised of active organic matter.

**Soil pH** - the level of soil acidity or alkalinity. Above 7.0 is alkaline, 7.0 is neutral and below 7.0 is acidic. This measurement, sometimes referred to as the soil water pH, is made with soil in distilled water. A pH between 6.0 and 6.8 is best for production of most field crops.

**Lime Index** - an indicator of the reserve or potential acidity in soil and is used to determine the quantity of lime needed to correct the pH of an acid soil. Lime index measurements are made only on samples testing less than pH 6.8. The lime index usually falls between 70 and 60. With a lime index above 70, no additional lime is needed. As the lime index decreases below 70, more lime is required to bring the pH back up to 6.5.

Soil test **phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg)** values are reported in parts per million (ppm). For mineral soils, 2 lb/acre equals 1 ppm (parts per million). To interpret how specific ranges relate to your management goals and crop, contact your local extension agent or read "Understanding the MSU Soil Test Report" E-0015. Nitrogen (N) is not measured in this test despite being an essential macronutrient. As a dynamic nutrient with various pathways of movement, N content changes quickly; accurate testing requires immediate freezing and is an expensive process. Therefore, N recommendations are based on research, organic matter content, cropping history, and crop needs.

**Organic Matter**- is reported as percent of active organic matter in the soil. The active rather than the total organic matter content is reported because this part is important in nutrient holding and the adsorption of herbicides. Most mineral soils in Michigan have active organic matter contents between 1 and 4 percent and vary based on soil texture.

**Cation Exchange Capacity (CEC)**- an indicator of the nutrient holding capability of a soil. It is a relatively permanent characteristic of each soil and is not easily changed. In general, the greater the clay and organic matter contents, the higher the CEC of a soil. As the soil pH changes, the CEC value will also vary somewhat. The higher the CEC, the greater the capacity of the soil to hold nutrients and bind certain pesticides. The CEC of a soil is also important in determining permissible heavy metal loading rates associated with land application of sewage sludge.

**% of Exchangeable Bases**- information on the nutrient balance among potassium, calcium and magnesium. The percentages reported assume K, Ca and Mg comprise 100 percent of the exchangeable bases, and are used to determine potential magnesium deficient situations.



## FERTILIZER RECOMMENDATIONS & FOOTNOTES

Fertilizer recommendations are based on the soil test results and crop information provided. Recommendations are given in pounds of N (nitrogen), P<sub>2</sub>O<sub>5</sub> (phosphate) and K<sub>2</sub>O (potash) for the major nutrients and in pounds of element per acre for each of the micronutrients. Commercial fertilizer analyses are similarly reported as percent of the element present. When the cropping information is provided, fertilizer recommendations are given for two crops. These may be for a two crop sequence or two alternative crops. The nutrients recommended can be supplied from a wide variety of fertilizer materials and applied through various combinations of pre-plant broadcast, planting time band and side dress applications. Since many ways are available for a farmer to supply the nutrients in the recommendation, it is suggested that the farmer work closely with the local MSU Extension Service agricultural educator, a consulting agronomist, or horticulturist, and/or a fertilizer dealer to determine the most suitable fertilization program for their farming operation.

**Major Nutrients:** Recommendations given for N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O are those which will result in the most economical yields. This assumes that the soil sample is representative, that a realistic yield goal has been chosen that average weather prevails and that good management practices are used. However, due to variations in these factors, the most economical fertilizer rate may vary from those given.

**Micronutrients:** The micronutrients for which recommendations are most frequently given are zinc (Zn), manganese (Mn), copper (Cu) and boron (B). Recommendations for Zn, Mn, and Cu are based on crop response, soil pH and soil test level. No recommendation will be given for these three micronutrients without a soil test. Boron is recommended based on crop response, soil texture and soil pH. Fertilizers are labeled according to the percent of a micronutrient contained. The percentage needed to supply the recommended amount will depend on the fertilizer rate being applied.

**RECOMMENDATIONS:**

**Limestone:** NONE

**Target pH =** 6.8

**Tillage Depth:** 6 inches

**% Stand:**

**Plant Nutrients:**

**Micronutrient: (Optional)**

Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P <sub>2</sub> O <sub>5</sub> /A)	Potassium (lb K <sub>2</sub> O/A)	Boron (lb B/A)	Manganese (lb Mn/A)	Zinc (lb Zn/A)	Copper (lb Cu/A)
Alfalfa hay	6ton	0	0	280	2.0			

**MESSAGES:**

For questions about interpreting your soil results go to the following website: <http://fieldcrop.msu.edu/uploads/files/FieldCropsPointofContactMap.pdf> and contact the MSUE agent in your area.

**Lime:** When lime is required to neutralize excess soil acidity, the lime recommendation includes two pieces of information.

- The first line indicates the tons of lime required to achieve the necessary pH. The lime recommendation will be printed only once unless crops 1 and 2 have a different lime requirement. When this occurs, the following footnote will print out: "Lime to suggested pH for the most important crop in your rotation. Only one application of lime is intended." Do not apply both rates.
- The next line gives the pH to which the soil should be increased by liming. This is dependent on the crop(s) being grown. When alfalfa is part of the crop rotation, pH 6.8 is indicated. For most other field and vegetable crops, pH 6.5 is indicated.

When thoroughly incorporated to the depth indicated, the soil pH goal will be achieved in two to three years with agricultural lime. For no-till situations, the lime recommendation is designed to neutralize the acidity in the top two inches.

**Footnotes:** The numbers printed on the footnote line refer to the numbered footnotes listed in the footnote section. The footnotes listed for crop 1 and crop 2 may differ and apply only for that crop recommendation. The footnotes are printed out in special situations to help the farmer better understand the recommendations and maximize crop production through proper fertilizer management.

**Secondary Nutrients:** The need for Mg is indicated by one of two footnotes: 1) "Magnesium tests low, use dolomitic limestone," or 2) "Magnesium tests low, broadcast 25-50 ppm Mg or row apply 5-10 ppm Mg" The first footnote is printed when lime is required to neutralize excess soil acidity. The second footnote is printed when the magnesium test is low and the soil pH is adequate so that no lime is needed.