Understand your Agro-One Soil Test Results

1. **Check the crop and soil name**
   Agro-One uses the soil name and cropping plans you report on your submission form to generate fertilizer recommendations specifically for your field, so it's important that they're accurate. Look up your soil's name on the Web Soil Survey, websoilsurvey.nrcs.usda.gov/, and don't leave the future crop plan blank on the submission form. If you're not sure what you're going to grow, at least list "mixed vegetables" as the upcoming crop. Also remember that the recommendations are only as good as the sample you took in your field. Your sample should be composed of a mixture of at least ten 8-inch soil cores from around the field.

2. **Look at the soil pH**
   pH is a measure of soil additivity and affects the availability of most soil nutrients. For most crops, a pH between 6.0 and 7.0 gives the best nutrient availability. If the pH is too high or too low, adding more fertilizer won't fix the resulting nutrient deficiency. pH must first be corrected by adding lime (to raise pH) or sulfur (to lower pH). Check the fertilizer recommendations at the bottom of the test to see the lime recommendation for your field.

3. **Major nutrients: P, K, Ca, and Mg**
   The soil levels are reported in pounds per acre (lbs/A) or parts per million (ppm). Notice that ppm x 2 = lbs/A, so it is easy to convert between units. The relative levels of the soil nutrients to the right of the lbs/acre results are the most important to notice, since the same nutrient lb/acre may be high for one soil type or crop while for another it is medium. “High” is considered to be a good level and may not generate a fertilizer recommendation. A "medium" level is considered to be adequate for the short term but nutrient supplementation may be recommended to maintain or build soil test levels for the future.

   **Excessive Nutrients**

   *Morgan* versus *Mod Morgan*
   Agro-One will use one of two chemicals to extract the nutrients in your soil sample before they are measured, either "Morgan" solution or "Modified-Morgan" solution. Cornell field crops experts prefer the Morgan solution because it reports P levels that correlate more accurately with recommendation database when soil P is low, allowing for more accurate P fertilizer recommendations for field crops. For fruits, vegetables, lawns and gardens, the more economical Modified Morgan solution will be used because the nutrient recommendations are, in almost all cases, identical to those based on the Morgan test.

   If you are growing fruits or vegetables, your soil nutrient levels will never be reported as "very high," which would be considered excessive. Be aware that Cornell’s soil health group considers phosphorus levels above 50 lbs/acre to be excessive and a risk of polluting water.

Fact sheet prepared by Molly Shaw, January 2011.
4. Nitrogen. Nitrogen is not routinely reported on soil tests because it cycles quickly between chemical forms (ammonium, nitrate, nitrite, organic N), and is very sensitive to weather changes and leaching. Measuring nitrate-N (using a pre-sidusted nitrogen test) gives a snap-shot of plant-available nitrogen on the day the soil was sampled, but does not predict the season-long nitrogen supply. The lab can measure total N in a soil sample, but the interpretation of the resulting number is not clear. Therefore, the nitrogen recommendation at the bottom of the test is not dependent on your soil test. Rather, it is the amount of nitrogen normally applied to grow the crop you listed on the submission form. Some field samples reduce the N recommendation when you list legumes as previous crops on your sample sheet, but fruit and vegetable samples do not. Neither does the recommendation reflect the inherent N-supplying capacity of your soil, which is closely related to organic matter.

5. Organic Matter. The organic portion of the soil, though a small percentage of the whole, is critical for healthy soil function. High organic matter feeds soil microbes and leads to good soil structure, nutrient cycling and retention, improved water holding capacity, and other perks. Low organic matter means soil organisms are hungry and less active, leading to less nutrient cycling and a structurally degraded soil. How much organic matter a soil is capable of maintaining depends largely on the soil texture (inherent to the soil) and on past tillage (management). Soil organic matter increases, albeit very slowly over many years, with compost/manure applications, long term cover crops, and reduced tillage.

6. Other nutrients: Na, Al, S, Zn, Mn, Fe, Cu, B, Mo. Agro-One routinely reports only Al, Zn, Mn, and Fe, but does not interpret the results as “high, medium, or low.” The other nutrients can be tested upon request, for an additional fee. For fruit crops, the normal soil range for most of these nutrients is unclear, and B is best assessed with a leaf test. For vegetables only Zn and B have established levels. Soil test levels of Fe, Al and Mn are more useful for diagnosing a toxicity problem than for informing fertilizer recommendations. If Mn + Fe + Al = >150 lbs/acre, plant toxicity could result.

7. Fertilizer recommendations: Seen at the bottom of your test results, these are generated by the Cornell Recommendations Engine using the major nutrient results above. They are reported in pounds of actual nutrient, not pounds of fertilizer. For instance, 10-10-10 (N-P-K) fertilizer is only 10% nitrogen by weight, so to apply 100 lbs of nitrogen, you need 100/0.10 = 1000 lbs of fertilizer. In this example you also get 100 lbs P and 100 lbs K, which you may or may not need. Choose nutrient sources that minimize over-applying nutrients that you have in ample supply.

8. Comments: These are important to read, as they will contain nutrient recommendations beyond lime and N-P-K, as well as instructions on application timing.

9. Why do I have blank boxes? Some tests are not routinely done but are available upon request—if not requested, these boxes will be blank. Calcium chloride is sometimes used as an extractant to measure pH in very sandy soils. No TILL pH focuses on the pH in the top inch of soil, since all nutrients and herbicides are applied to the soil surface. Soluble Salts is generally used as a diagnostic tool if road salt injury or high salinity due to fertilizers is suspected. Na, S, Cu, B, and Mo can be requested for an additional fee, see “other nutrients” above. If the major nutrient soil test levels chart or the fertilizer recommendations are missing it is because the soil name or this year’s crop was missing on your submission form. Call the lab and make the correction.

10. More information: Soil science is complicated and this fact sheet only scratches the surface. For more information, see the Cornell Nutrient Spears Program’s extensive fact sheet collection at http://nmsp.cals.cornell.edu/guidelines/factsheets.html