ALABAMA COOPERATIVE Extension SYSTEM
Alabama A&M and Auburn Universities

AGRONOMY AND SOILS SERIES

TIMELY INFORMATION
Agriculture & Natural Resources

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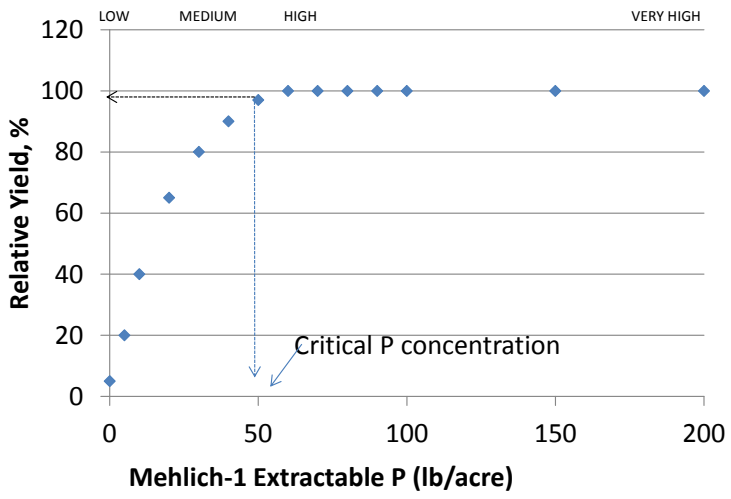
Critical Soil Test Values (For P, K , Mg and Ca)

The research and data that backs up our soil testing program is extensive and complicated. Interpreting soil test values is not simple considering all the factors that affect crop growth and yield. There are at least 16 elements essential for plant growth and plants have different requirements for the primary, secondary, and micronutrients. Each element has different chemistry and reacts with soils differently. Although soil testing was introduced as a quick and simple way to assess soil fertility, the science behind it is not simple at all.

One concept behind soil testing is that of *critical soil test concentrations*. Soil Science Society of America defines *critical soil test concentration* as ". . . that concentration at which 95% of maximum relative yield is achieved." This value usually coincides with the inflection point of a curvilinear yield response curve (see figure below). Concentrations below the critical concentration are rated medium, low or very low, and fertilizers are generally recommended for that nutrient. Value above the critical concentration are rated high, very high, or extremely high and no fertilizer is generally recommended Auburn University's Soil Testing laboratory uses 2 times the critical value as "very high", and 5 times the critical value as "extremely high". A recent proposed change by USDA-NRCS in their national Nutrient Management Code 590 will not allow P applications to soils above 10 times the critical soil test P concentration. Auburn's lab never recommends P above the "high" rating.

Calibration curve for Mehlich-1 extractable P on yields of cotton, corn, and legumes on group 1 & 2 Soils in Alabama.



Having just one critical soil test value for all crops, all soils, and all soil test procedures would certainly make interpreting soil testing a lot easier. Unfortunately, nature is not that simple. The more we learn about plant nutrition and soil fertility, the more complex critical concentrations become. The critical values in Table 1 are those that have been used for P and K in Alabama crops and soils since 1995. These are based on soil fertility research throughout Alabama since the 1950s.

No one can remember all these critical soil test values but consultants and extension agents who work in a particular region or with certain crops will remember those most relevant. For example, 50 lb/acre Mehlich-1 P and 120 lb K/acre and 50 lb Mg/acre will cover most major crops and soils in Alabama. If you work with peanuts, remember 300 lb Ca/acre.

Table 1. Critical soil test values used by the Auburn University Soil Testing Laboratory. As a general rule, no increased yield response is expected to a nutrient above its critical value.

Crop	SOIL GROUP*			
	1 Sandy soils (CEC 0-4.6)	2 Loams (CEC4.6-9.0)	3 Clayey soils of Limestone Valleys & High org. matter soils (CEC 9.0+) –	4 Clays of Black Belt (CEC 9.0+)
Extractable P (lb/acre)				
P LEVEL 1. Peanuts, pine trees, blueberries & centipedegrass	19	19	11	27
P LEVEL 2. All other crops	50	50	30	72
Extractable K (lb/acre)				
K LEVEL 1. Peanuts, pine trees, blueberries & centipedegrass	40	60	80	120
K LEVEL 2. Corn, grasses, soybeans, fruits and nuts	80	120	160	190
K LEVEL 3. Cotton, legumes, gardens, lawns, shrubs, vegetables	120	180	240	240
Extractable Mg (lb/acre)				
All crops	25	50	50	50
Extractable Ca (lb/acre)				
Peanuts	300	300	300	300
Tomatoes, peppers, fruits & nuts	500	500	500	500

- Soil Group 1, 2 & 3 are extracted by Mehlich I, and Group 4 (alkaline Black Belt) are extracted by the Mississippi extractant.

Adams, J.F., C.C. Mitchell, and H.H. Bryant. 1995. Soil test fertilizer recommendations for Alabama Crops. Agron. & Soils dep. ser. no. 178. Ala. Agric. Exp. Sta., Auburn University, AL

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