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This article, written by Drs John Grove and Edwin Ritchy, UK Extension Soils Specialists focuses on fertility. Soil pH and nutrient availability, both essential for yield can be addressed by proper soil sampling and testing. There are two ways to lose money in your soil fertility program; adding something you don't need or not adding something that you do need.

The first step is a properly collected sample typically no more than 10 to 20 acres in size, sampling to 4 inches deep in no-till fields and 6 inches deep in tilled fields. Avoid separately sampled areas within the field that might greatly affect test results such as near gravel roads, poorly drained areas, former livestock lots, and former tobacco patches with history of heavy fertilizer or manure use. Submit the samples to a lab that uses Mehlich 3 extractant which was developed for soils in the southeastern U.S. The two most common reporting methods are lb nutrient/acre or ppm nutrient in the sample. The conversion between the two is simple, multiply ppm by 2 to convert to lb per acre, or divide lb per acre by 2 to get ppm. Make sure you understand the unit your chosen lab is using. Spring soil samples will differ slightly from fall soil samples. For continuity of interpretation, be sure to collect soil samples at the same time of the year.

Once soil samples are collected and analyzed, the next thing is to evaluate the results for individual fields. Follow soil test recommendations for the field. Don't average soil test values

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across multiple fields – apply what is needed to the field that needs it. Generally, the best bang for the soil fertility buck is going to be soil pH management. Row crops perform best at a pH around 6.5. Maintaining a pH in this range optimizes availability of phosphorus and micronutrients, promotes good root growth and health, and can positively influence the activity of certain herbicides.

Liebig's Law of the Minimum is a good rule when deciding which nutrient(s) to add. It states that crop yield is proportional to the most limiting essential nutrient. Adding a non-limiting nutrient will not maximize yield if the limiting nutrient is not addressed. Adding potassium to a phosphorus deficient soil will not remedy phosphorus deficiency or vice versa. Adding phosphorus to soil with a pH of 5.3 is not as effective for improving yield as liming the field and increasing the soil pH.

In very tight times with limited fertilizer budgets, rates might need to be cut to get several needed nutrients on the field. Work from The University of Tennessee showed that a half rate of limestone was almost as effective in neutralizing soil acidity as the full recommended rate but the benefit didn't last as long. You can cut lime, but acidity will eventually have to be addressed. Soil test values in the high range don't require fertilizer addition. Crops growing on soils testing in the 'medium' range are less likely to respond to fertilizer additions, especially when at the higher end of the medium range. The soils testing in the 'low' range for available nutrients are most likely to limit crop growth and provide a positive return on investment of fertilizer.

Plenty of products are available with remarkable claims about reducing overall soil fertility needs, but a pound of fertilizer is a pound of fertilizer regardless of the form. For example, a gallon of ammonium polyphosphate (APP, 10-34-0) weighs about 11.7 lb and

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contains about 4 lb P₂O₅. To obtain 50 lb P₂O₅/acre using APP will require 146 lb or 12.5 gallons APP/acre. To get the same 50 lb P₂O₅/acre with DAP (18-46-0) requires 109 lb DAP/acre. This 50 lb P₂O₅/acre will not be replaced by a product at a use rate of 1-2 quarts per acre, regardless of their claims. Some fertilizer application volume can be reduced if placing in close proximity to the row.

If budgets are tight, address low-testing nutrients first, then those at the low end of the medium range. The lower the soil test value the greater the chance for a profitable crop response. Don't spend money on miracle products that merely claim to replace proven fertilizer products – go with what works.

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