

NEWS & VIEWS

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Don't Forget Soil Test Calibration!

PRECISION farming is attracting a lot of attention these days. It is especially big in the Midwest and is rapidly catching on in the West. Many companies are considering how to utilize this new technology in serving their customers. Envisioned benefits are higher yields and more efficient use of inputs, leading to more profit and enhanced environmental protection. But there is more to producing higher yields than simply introducing slick software programs and sophisticated machinery.

In the rush to grid fields and develop brilliant color overlays, the role of traditional agriculture must not be forgotten. Specifically, soil testing research must be continued. Moving to higher yields through introduction of new varieties or modified management systems requires a continuing program of field calibration research to ensure accurate fertilizer recommendations. This is a formidable task considering how rapidly production agriculture is advancing. At the same time, the pool of production researchers shrinks with university and government cutbacks and those remaining are drawn into non-traditional areas such as waste disposal and environmental quality.

Calibration research is done in the field. It requires multiple sites and site-years spanning a range of soil and environmental conditions. The work is labor intensive and is frequently difficult to publish in scientific journals because of its applied nature. As a result, years and even decades pass between calibration of many cropping systems. Frequently a new calibration study will result in substantial increases in fertilizer recommendations since previous calibration was done at a much lower production level. In the interim, considerable yield potential and profit have been lost.

Potassium (K) fertilization of cotton is a case in point. New guidelines from the University of California (*Cotton Potassium Fertility Guidelines for the San Joaquin Valley*, Pub. 21562) recommend up to 400 lb of K_2O/A with the soil test interpretation adjusted according to a K fixation test. Additional in-season foliar or water run K is suggested at first bloom when yield potential is good, regardless of soil test values or earlier K fertilization. Research also indicated a sampling depth of 6-18 inches is best for cotton. Previously, statewide guidelines for cotton were not available. Because of lack of information, some questioned whether any K at all should be applied. It is now recognized that up to half the cotton acreage in the San Joaquin Valley may be K deficient. The new California guidelines for K fertilization of cotton represent a costly and time consuming process (but very worthwhile) by many researchers and Extension workers. This is clearly a success story for the farmers who had been inadvertently under fertilizing their crops, resulting in loss of both yield and quality. Now completed, what is the next success story just waiting to happen in California? In your state?

Another success story is unfolding in Utah. Researchers at Utah State University are presently reevaluating calibration data for both phosphorus (P) and K for irrigated alfalfa production. Results from the first two years of the study suggest that current recommendations are too low. Soil test sufficiency levels and corresponding rates of both fertilizer P and K should be raised. These observations are based on only two years of data. The research will be conducted for an additional two years and should result in appreciably higher rates of P and K fertilizer recommendations by Utah State University for irrigated alfalfa production.



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As another example, a 10-year P calibration study by Montana State University researchers completed in 1995 for spring wheat indicated that the previously established sufficiency level of 16 parts per million (ppm) sodium bicarbonate (NaHCO_3) extractable P is still valid. However, recommendations for rates of P fertilizer should be increased, and a starter P application should be made regardless of soil test. Researchers cite advances in spring wheat varieties and production technology for prompting this study and the resultant new recommendations.

An innovative and successful calibration program is being conducted in Idaho. There had been serious concern about the adequacy of fertilizer guidelines from the University of Idaho. Many claimed that the recommendations were simply too low for present yield potentials under intensive management systems. It was suggested that part of the problem stemmed from small plot calibration that did not take into account whole field variability. Concern increased when the National Resource Conservation Service imposed nutrient limitations on N and P rates equivalent to 1.2 times University guidelines for growers participating in government subsidy programs.

The Cooperative Fertilizer Evaluation Program (CFEP) was created in 1993 through joint support from the University and fertilizer industry. Its goals are to:

- Accumulate calibration data.
- Build a cooperative relationship among private industry, growers, and the University by jointly developing new fertilizer guides.
- Develop more broad-based data combining both on-farm and agricultural experiment station information.
- Promote environmental responsibility based on sound scientific data.

Field sites for CFEP plots were established on commercial fields with cooperators considered to be excellent growers. Plot size was typically 50 to 100 feet wide by the length of the field. Rates of nitrogen (N), P or K fertilizer were applied from zero up to 2 to 3 times the rate recommended by soil analysis. At the end of the season, plots were harvested with commercial equipment, subsamples collected to determine grade and quality, and the information recorded on standardized CFEP worksheets.

Through 1997 (5 years), nearly 200 CFEP plots at a cost of about \$300,000 have been conducted, encompassing all the major crops of Idaho. Financial support has come from the Idaho Crop Production Association, commodity groups, and private donations. A tremendous amount of work has been done by growers and fieldmen responsible for overseeing field activities and gathering much of the information. The unified effort by all in-

volved has been a key factor in the success of the CFEP program.

The data gathered have indicated that there is sufficient justification to raise the fertilizer recommendations for some of the major Idaho crops. A prime example is the P recommendations for potatoes. The revisions to the University guidelines are:

- Raising the extractable NaHCO_3 -P sufficiency level from 15 to 20 ppm .
- Increasing the recommendation by 10 lb/A P_2O_5 for each 1 percent increase in free lime.
- Recommending a starter application of 80 to 100 lb/A P_2O_5 .
- Adjusting for yield goal based on crop removal of P.

The CFEP program is a continuing program...a successful program. It could serve as a model for other states in striving to maintain updated calibration data for their soil testing programs. Dr. Jeff Stark, Research Agronomist, University of Idaho Research & Extension Center, Aberdeen, is presently project coordinator. For further information see: Terry A. Tindall and Jeffrey C. Stark, "Cooperative Fertilizer Evaluation Program Seeks Appropriate Recommendations," *Better Crops with Plant Food*, No. 1, 1997.



Examining CFEP potato plots are, from left: Bob Adams, private consultant; Dr. T.A. Tindall, formerly with University of Idaho; and Rocky Duncan, potato grower.

These are just a few examples to illustrate the value of calibration research. Soil testing continues to be widely recognized as an essential diagnostic tool, but the point to be made is that soil testing programs based on outdated calibration data (or no data at all) can be counter productive. In each of the examples cited above, new research produced higher recommendations. Previous recommendations were obviously too low for optimum production.

Precision farming and the accompanying new computer hardware and software will best be served by up-to-date calibration information that accurately reflects the nutrient needs of today's production systems and anticipates those of tomorrow. ■