

**SOIL HEALTH MEASUREMENTS AND INTERPRETATIONS:
*Public Labs' Concerns and Issues***

Background

In 2014, the Southern Extension & Research Activity Information and Exchange Group 6 (SERA-IEG-6) (<http://www.clemson.edu/sera6/index.htm>) expressed concerns over the adoption and promotion of new soil testing methods to evaluate soil health by the Natural Resource Conservation Service (NRCS)-USDA. In a letter to Jason Weller, Chief of NRCS, the group through Dr. David Hardy (chair of SERA-IEG 6 then) noted a clear lack of scientific principle and approach to promote and publicly offer soil health tests to growers; recommendations from soil health test results were not clearly validated to enhance crop productivity. Secondly, the soil testing community as a part of the land-grant university system, which is highly regarded as an unbiased source of grower information, had not been involved in discussion of soil health prior to its adoption and promotion. Fast forward to July 2016 and the understanding of soil health measurements and interpretations is still undefined and vague in the minds of many, thus compelling the SERA-IEG 6 group to bring forward the concerns listed below.

Compelling Issues on NRCS's push for the promotion and adoption of Soil Health Program

1. Lack of multi-regional research as related to meaningfulness/usefulness of measurements of soil health parameters under different soil types, climate, etc. These have not been studied adequately. Limited data (if any) exist that actually show benefits of soil health testing in localized areas. Anecdotal evidence at best appears to be the foundation to potential benefit without regard to clear scientific development to establish cause and effect relationships in a variety of environments.
2. There is lack of peer-reviewed, published research to validate relationships between soil health parameters and agronomic production or environmental consequences to allow for sound interpretation to aid management decisions.
3. The cost of testing has not undergone economic assessment. At what field scale will soil health tests be needed and at what costs? Will fewer nutrient analyses samples be run, as physical and biological testing costs increase? If the proposed soil health tests are widely implemented, they are laborious, expensive, and cannot easily be adopted by public service labs as presently designed and instrumented.
4. Existing recommendations from analytical lab methods were developed from regional field correlation and calibration studies. Although the same laboratory methods may be employed by labs in numerous states, recommendations do differ based on research.

Since correlation/calibration studies between soil health metrics and yield were not done when this program was rolled out, what will the recommendations be and where will they originate? If a given soil health test works in Texas, is that really applicable to Mississippi, Kentucky, Wisconsin, and Oregon without local calibration? A regional approach to implementing soil health test methods appears to be absent so all soil and climatic environments seem to be considered equal.

Specific comments by SERA-IEG 6 members

- Online NRCS Soil Health Assessment and posted resources lack any quantitative information. The value of adequate soil physical, biological, and chemical properties are attributes soil scientists agree with. However, measurement and interpretation of these properties in the proposed NRCS test has shortcomings. Most soil health assessments seem to be related back to tillage systems. While laboratory techniques can be used to determine physical properties of soils, disturbance of these samples will reduce precision and accuracy of test results compared to measurement in the field.
- Use of cover crops is a good plan. However no consideration appears to be made for winter soil profile moisture losses, crop failures or increased potential for herbicide resistant weeds. Where are the economics on this?
- The concepts of no-till and reduced tillage have not been adequately adopted in many areas of the country. A strong reduced tillage component needs to be at the forefront of Soil Health.
- The spatial and temporal variability of the biological indicators in the soil health test has not been adequately defined to know how best to take a sample with respect to the number of cores in a field or the time of year to sample. For example, soil respiration can vary greatly depending on the time of year the sample is taken. This is also a regional concern.
- During the Western group (WERA 1) meeting, data from a proficiency program (Agricultural Laboratory Proficiency, ALP) presented by Bob Miller (ALP Coordinator) showed significant inter- and intra-lab variability with the Solvita test. The magnitude of the variability prompted questions on the usefulness of the test.