Nutrient Analyses

This project has promoted accurate, unbiased procedures for nutrient analyses, facilitating better nutrient management that ensures the sustainability of agricultural production and natural resource stewardship in the southern U.S.

Who cares and why?

Farmers use manure, fertilizer, and other nutrients to maximize crop and forage yields; however, nutrients must be applied at the appropriate time and in the proper form, amount, and location to minimize human and environmental health risks (such as hazardous byproducts, contaminated runoff, and erosion). Accurate and timely analyses of soil, water, and plants help determine which nutrients are needed as well as the appropriate amounts and best application methods for optimal results. To perform these analyses, laboratories need safe, precise, and cost-effective testing procedures and tools. Coordination across regions and among local, state, and federal agencies is important to make sure that all laboratories have access to updated procedures, new technologies, and standardized reasoning methods for interpreting results. Otherwise, it is difficult to compare results and harder to use the results to develop comprehensive, effective nutrient management guidelines, which are essential for the economic and environmental sustainability of agricultural production and the quality of life in rural and urban areas.

Animal wastes are used widely in agriculture to fertilize crops. Methods for analyzing the nutrients in wastes and predicting their potential availability to plants helps avoid over application and minimize risk to the environment.

Although originally developed to assess nutrient needs, soil testing methods are now being used to predict and diagnose environmental issues. For example, excess nitrogen and phosphorous in soils can pollute surface waters, causing algal blooms that threaten water quality and aquatic organisms.

What has the project done so far?

Over the last five years, SERA-006 researchers have continued to review, update, and publish procedures used by state soil testing labs in the southern U.S. The group has also developed and implemented new, less hazardous methods, including ones for determining lime requirements for soils. A soil testing methods manual covering all lab procedures used in southern U.S. is currently being developed. SERA-006 has also focused on fostering quality assurance and quality control among labs in the Southern Region. SERA-006 scientists have evaluated new instrumentation and promoted uniform calibration for soil testing tools and analyses. This work has facilitated the development of resource management guidelines across areas that share similar soils, crops, climate, and environmental concerns. For example, SERA-006 researchers have published soil testing recommendations for cotton in coastal plains soils and have promoted regional fertilizer recommendations for many states. SERA-006 researchers and Extension professionals have provided easy access to research data and educational materials for labs, agencies, and the public through an up-to-date project website. Project members have also disseminated information during regional meetings of soil test work groups and national meetings of the American Society of Agronomy and Soil Science Society of America. Extension specialists have also hosted conferences, laboratory tours, and training programs and have developed outreach materials including a soil test video.

Grain sorghum is an emerging crop in the southeastern U.S., often replacing corn on drought-ridden soils. Farmers need to know the critical levels of micronutrients required for optimum plant growth. Soil tests for sorghum must be calibrated appropriately; however, accurate calibration for a specific crop requires detailed research over many years. Furthermore, as crop varieties change, calibrations must be verified and updated.

Impact Statements

Through research, coordination, and outreach efforts, SERA-006 has:

Developed and documented a scientific basis for more effective nutrient management plans

Improved public knowledge and acceptance of science-based nutrient management plans

Widened the scope of standard agronomic tests and interpretations

Improved laboratory worker safety and efficiency

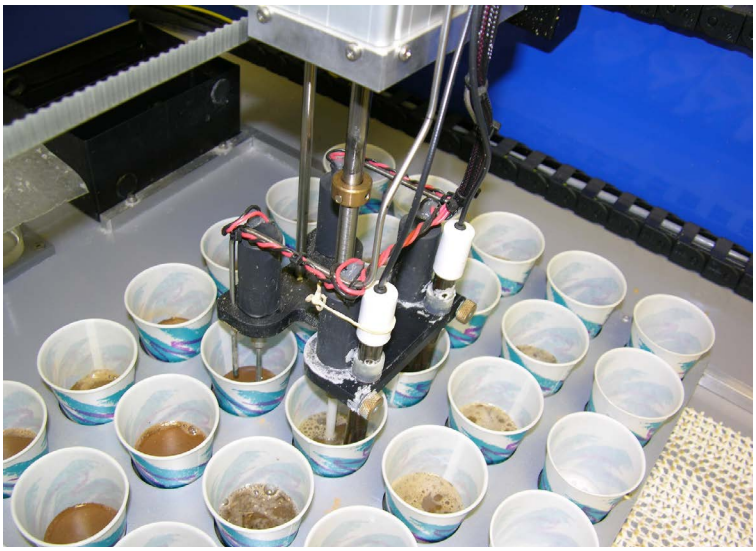
Enabled faster and more accurate data transfer, making it possible to implement nutrient management plans in a timely manner

Reduced over application of nutrients, saving producers tens of millions of dollars and protecting surface waters and groundwater from potential contamination

Provided a more highly trained workforce to address the nutrient management needs of both farmers and urban areas

Above: Master Gardener programs need access to nutrient analysis data so that volunteers can advise and educate the public about gardening.

Right: The Young Scholar Program at UGA teaches students how to extract soil samples for testing.



In many labs today, soil and water pH measurements are made using robots instead of by a chemist at a lab bench. In recent years, SERA-006 researchers have developed new methods to measure pH that minimize hazardous chemicals in labs, thus lessening exposure of workers.

What research is needed?

To provide proper nutrient management recommendations, more research is needed on the micronutrients required for optimum crop production and animal nutrition. Researchers especially need soil test calibrations for modern high-yielding plant varieties. Researchers must also work on widening the current scope of soil testing to determine the environmental fate of unused nutrients in agricultural systems and to examine the potential toxicity of copper and zinc to crops. Future research will also focus on remote sensing methods for nutrient assessments at the regional or watershed scale and nanotechnology that will allow precise targeting and placement of nutrients in soils and plants.

Want to know more?

Administrative Advisors:
Research, Stephen Workman (steve.workman@uky.edu)
Extension, Joe Zublena (joe_zublena@ncsu.edu)

Project website:
http://www.clemson.edu/sera6/index.htm

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Compiled and designed by Sara Delheimer