Updating University of Missouri Soil Test Based Fertilizer and Lime Recommendations Program

Manjula Nathan, Associate Professor/Director, MU Soil and Plant Testing Laboratory  
Division of Plant Sciences, University of Missouri  
Peter Scharf, Professor, State Nutrient Management Specialist, Division of Plant Sciences,  
University of Missouri  
David Dunn, Extension Associate/Manager, Delta Soil Testing Lab

Objectives, including relevance of project to Missouri fertilizer/lime use:
- Update and re-write the University of Missouri Soil Test Recommendations Program to include the revisions and updates made by the University of Missouri Soil Fertility Working Group.
- Update the soil test to a web based system that is independent of operating systems, offices systems, and web browsers.

University of Missouri (MU) soil test and fertilizer recommendation program is used by the MU Soil Testing Laboratories located at Columbia and Portageville to provide fertilizer and lime recommendations for row and forage crops to about 40,000 farmers each year. The soil test based recommendations from University of Missouri soil testing labs are being used to apply fertilizer and lime for about 4,000,000 acres of row crops and forages for efficient use of fertilizer and lime, and to achieve economical returns from crop production. In addition, the state and federal agencies such as the Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA), Missouri Department of Natural Resources (MDNR), Missouri Department of Agriculture, and agricultural industry personnel, (crop consultants and fertilizer dealers) and individual producers rely on the MU soil testing database program to get unbiased, research based fertilizer and lime recommendations from University of Missouri.

During the past 15 years, there has been significant research in Missouri and other states on soil testing and crop fertilizer needs relevant to Missouri conditions. Some of that research was due to the result of support by the Missouri Fertilizer and Ag Lime Board.

The Soil Fertility Working Group is the committee charged with reviewing and approving changes to MU recommendations. This committee includes research and extension faculty working on soil fertility issues at MU and the heads of the Columbia and Delta soil testing labs. The members of these committee has been working for the past two years on revising the fertilizer and lime recommendations based on research findings, and has come up with significant updates. Some areas where significant changes have been made in the soil test based fertilizer recommendations include:
- Integrating economics into corn nitrogen recommendations.
- Updates to the buildup equations for soil test phosphorus and potassium.
- Updates on crop removal values.
- Revisions to Missouri lime and magnesium recommendations.
- Changes to the soil test recommendation rating system.
Implementing recommendation changes has been limited by the ability to include the revisions in the MU Soil Testing Database Program that benefits thousands and thousands of growers who receive the fertilizer and lime recommendations from the MU soil testing labs each year. The soil test database program that we currently use is a client based system that was written in VB6. Within the code for this system is where all of our calculations and recommendations are stored. This has limited our ability to implement new calculations and recommendations. Our current program was also written for specific versions of Microsoft Office and this has limited our ability to generate new reports for our customers. One of our biggest challenges is that VB6 is no longer a supported system and every time there is an update to either operating system or Microsoft Office we have to find someone to fix our program.

We have spent the last year looking at other University Soil Labs across the United States to see what systems they have in place. With the exception of a few labs our system while it has several problems offers features that the other labs do not have. Some of the features we have are the capability to upload lab data from our test equipment, email word documents with lab results and recommendations to our clients, and an online soil & plant recommendation system. Our online system also allows anyone to come to our website and enter their values for different lab tests and then select their crops. The system will then display the soil recommendations.

Since the MU Soil testing labs are self supporting and exist on the funds generated from our soil fees, we do not have the ability to support a full time programmer’s salary. This project is crucial to our lab and our ability to continue to provide unbiased research based fertilizer and lime recommendation updates to producers and retailers in Missouri. We are seeking funds to create a Web Based program, which will support the MU Soil Testing Laboratories and allow us to implement new recommendations quickly in the future.

The main objective of this proposal is to provide support for a 0.5 FTE of programmer’s salary for three years. We estimate that it will take three years to design a new system, launch the new system, convert the old data, test the new system, and to support the system in its beginning stages to work out any issues. The programmer will ensure that the future recommendation changes to the MU soil test and fertilizer and lime recommendations can be made in the database. This will allow us to make the change as soon as it goes into effect and make the recommendations available online to be accessed by all citizens of Missouri.

**Procedures:**

We need three years to design a new system, launch the new system, convert the old data, test the new system, and to support the system in its beginning stages to work out any issues. The new system will have a table in the database for soil calculations, and soil recommendations, this is critical for future updating of the soil recommendations. The new system will be a web based system that is independent of operating systems, office systems, and web browsers. Updating the soil test data base programs will include managing lab data with sample identification, developing soil test based recommendation using current revisions, creating soil test reports in user friendly formats, enabling queries of the databases, and generating annual reports. The MU soil testing labs will fund 0.5 FTE of the position and request the fertilizer and lime advisory committee to fund the other 0.5 FTE of the programmer’s salary to re-write the MU soil test
database program. I will be mainly working with the programmer in updating the soil test
database fertilizer and lime recommendation program with inputs from CO-PIs and members of
the MU Soil Fertility Working Group.

**Current status/importance of research area:**
Agricultural producers, Federal and State Government Agencies and agriculture industry
personnel in the state of Missouri rely on MU soil test and fertilizer recommendations to provide
science-based advice on fertilizer and lime recommendations and use. The incorporation of MU
recommendations into the standards and regulations of agencies such as NRCS and MDNR has
intensified the need to update and revise our current soil test recommendations for fertilizer and
lime applications.

Our current soil test database program needs to be updated and revised to include all the
significant revisions made by the soil fertility working group to the MU fertilizer and lime
recommendations. This proposal seeks to update the soil test based fertilizer and lime
recommendation program that is being used by the MU soil testing labs to include, corn nitrogen
recommendations, soil test phosphorus and potassium buildup equations, soil test magnesium
and lime recommendations and other updates as time allows.

**Timetable:**
We plan to work to identify a qualified programmer to work on this project as soon as the
funding is approved. We are requesting for partial funding (0.5 FTE) of the programmers salary
for three years 2011-2013.

**Strategy for application/transfer of knowledge:**
This project’s sole focus is the incorporation of revisions made to the MU soil test fertilizer
recommendations and to update the current soil test database program to a web based system that
is independent of operating systems, offices systems, and web browsers. Changes made by the
MU Soil Fertility Group will be stored in a database table and no longer intertwined in the soil
testing software. This will allow us to quickly implement the recommended changes made by
the MU Soil Fertility Group in the future. Once the revisions are made in the data base it will be
disseminated to all the clients who use the soil testing services. In-service training of Regional
Agronomy, Soils and Natural Resources and Horticulture specialists on using the program online
will allow access soil test reports, and fertilizer and lime recommendations from anywhere. Any
citizen of Missouri will be able to access current MU soil test recommendation online via the
online recommendation program.

**Economic Impact:**
With the increasing prices of both fertilizers/lime and agricultural commodities maintaining
proper soil fertility conditions has never been more critical. If fertility conditions are sub-
optimal reduced yields greatly impact a producer’s bottom line. Conversely over fertilization
can result in unnecessary fertilizer purchases which negatively impact the bottom line. The
average value of fertilizer inputs in 2010 for the Boot heel of Missouri is in excess of $100 per
acre. This amount is spent annually on N, P, & K to protect over $1,000 in gross income per
acre. Revision of our recommendations program will assure producers that the most currently
available science is behind their decisions. Our recommendations programs are not only used by
MU labs but are required by federal agencies for compliance in many programs. As such they have been provided to most private labs offering services in Missouri. Changes in our system will impact more producers than our customers alone.

Today fewer and fewer producers are managing more and more acres. This often leads to scheduling difficulties. Producers need timely access to soil test results generated by our labs to guide their agronomic decisions. With the fast pace of computer development it is increasingly difficult to maintain the functionality needed to adequately support our customers’ needs. Funding of this project will allow the MU soil test system to keep pace in an ever advancing information technology field.

**Budget:**

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Resume of Manjula V. Nathan
Division of Plant Sciences, University of Missouri
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Email: nathanm@missouri.edu WEB: http://soilplantlab.missouri.edu/soil
Tel.: (573) 882-3250 (work), FAX: (573) 884-4288

Education
Ph.D. in Agronomy (1989), South Dakota State University
Major: Agronomy- Soil Fertility Minor: Chemistry
M.Phil. in Agric. (1981), Post Graduate Institute of Agriculture
University of Peradeniya, Sri Lanka
Major: Soil Chemistry Minor: Statistics
B.S. (Hons.) in Agric. (1978), University of Peradeniya, Sri Lanka
Major: Agronomy Specialization: Soil Science

Work Experience
2007- to date: Extension Associate Professor/ Director of Soil Testing & Plant Diagnostic Laboratories – University of Missouri, Columbia, MO
1994- to 2007 Extension Assistant Professor/ Director of Soil Testing & Plant Diagnostic Laboratories – University of Missouri, Columbia, MO.
1992- 1994: Associate Soil Scientist - Land Reclamation Research Center, North Dakota State University, Mandan, ND.
1990 - 1992: Postdoctoral Associate - Dept. of Soil Science, University of Minnesota, St. Paul, MN.

Honors and Awards
- 2007: Promoted from Assistant to Associate Professor, University of Missouri

Professional Service and Activities
- National Science Foundation Graduate Fellowship Panel Chair for Division of Plant & Animal Sciences (2005)
- Chair and State representative for NCR -13 Committee on Soil Testing and Plant Analysis (Chair: 2002 – 2004; Secretary: 1999; State Rep: 1996 - to date)
- Soil Testing and Plant Analysis Committee of SSSA - S 877 (2003 – to date)
- North American Proficiency Testing Program Oversight Committee of SSSA – S 890 (2002 to date)
- Editorial Board for Communications in Soil Science and Plant Analysis Journal (2002 to date)

Membership and Affiliations
American Society of Agronomy
Soil Science Society of America
Soil Testing and Plant Analysis Council
Sigma Delta Epsilon
Gamma Sigma Delta
AOAC International

National, Regional and State Assignments
- National Science Foundation Graduate Fellowship Panel Chair for Division of Plant & Animal Sciences (2005)
- Chair and State representative for NCR -13 Committee on Soil Testing and Plant Analysis (Chair: 2002 – 2004; Secretary: 1999; State Rep: 1996 - to date).
Publications

Refereed


Book chapters:


Abstracts:


Miscellaneous Publications:


Extension Presentations and Publications

Field Days Presentations:
Workshops, Conferences, Short Courses and Certified Crop Advisor Training:


Extension Guides and Fact Sheets:

Peter Clifton Scharf
Professor and Nutrient Management Specialist
Plant Sciences Division 210 Waters Hall
University of Missouri
Columbia, MO 65211

Research and Extension education interests
C developing, evaluating, and promoting tools to predict crop N needs, including variable-rate N management C evaluating N management alternatives including source and timing C minimizing environmental impacts of agricultural nutrients C coordinated management of soil, fertilizer, and manure nutrients C tailoring fertilizer and lime recommendations to account for soil properties C economic comparisons of production alternatives

Education
Ph.D. May 1993 Virginia Polytechnic Inst. and State University
Crop & Soil Environmental Sciences
M.S. July 1988 Virginia Polytechnic Inst. and State University
Agronomy
B.S. August 1982 University of Wisconsin
Biochemistry, Genetics

Recent Research Publications


Recent Extension Publications


CURRICULUM VITAE

DAVID J. (Dave) DUNN
University of Missouri
Delta Center, P. O. Box 160
Portageville, MO 63873
Phone (573) 379-5431
dunnd@missouri.edu

EDUCATION:
Degree: M.S. Geology (with emphasis in soils development) 1985
Institution: Iowa State University
Professor: Dr. Carl F. Vondra

Degree: B.S. Geology, 1980
Institution: Iowa State University

PROFESSIONAL EXPERIENCE:

Supervisor: Soil Testing Lab 1997-present
University of Missouri-Delta Center, Portageville, Missouri
Responsibilities:
1) Communicate to public the role of an integrated soil fertility program in crop production and environmental protection.
2) Provide relevant and understandable soil and plant analysis results to customers.
3) Maintain quality control of laboratory results while ensuring that results are available to customers in timely manner.
4) Supervise and train administrative and support staff, develop and implement annual working budget, maintain and purchase supplies and equipment as needed.
5) Develop and administer a soil fertility research program.
6) Provide research assistance to other multidisciplinary University of Missouri staff

Iowa State University, Ames, Iowa
Responsibilities:
1) Supervise and train student hourly workers.
2) Maintain equipment and purchase consumable supplies as needed.
3) Maintain quality control of laboratory results.
4) Communicate soil test results to customers.
5) Provide research assistance to other multidisciplinary Iowa State University staff, includes training of graduate students in use of analytical instruments.

Iowa State University, Ames, Iowa
Responsibilities:
1) Supervise and train temporary and student workers.
2) Maintain equipment and purchase consumable supplies.
3) Maintain quality control of laboratory results.
4) Maintain records of laboratory results for compliance with local, state and federal environmental laws.

RECENT PUBLICATIONS:


Peter Clifton Scharf
Professor and Nutrient Management Specialist
Plant Sciences Division 210
Waters Hall
University of Missouri
Columbia, MO 65211

Research and Extension education interests
C developing, evaluating, and promoting tools to predict crop N needs,
including variable-rate N management C evaluating N management alternatives including source and timing C minimizing environmental impacts of agricultural nutrients C coordinated management of soil, fertilizer, and manure nutrients C tailoring fertilizer and lime recommendations to account for soil properties C economic comparisons of production alternatives

Recent Research Publications

Education

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<td>B.S.</td>
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