Enhanced Efficiency Phosphorus Application for a Corn-Soybean Rotation

Investigators:
Kelly Nelson, Div. of Plant Sci., Univ. of MO, Novelty; Bruce Burdick, Div. of Plant Sci., Univ. of MO, Albany; David Dunn, Div. of Plant Sci. Univ. of MO, Portageville; Peter Motavalli, Dep. of Soil, Environ., and Atmos. Sci., Univ. of MO, Columbia; Manjula Nathan, Div. of Plant Sci. Univ. of MO, Columbia; Peter Scharf, Div. of Plant Sci., Univ. of MO, Columbia; and Gene Stevens, Div. of Plant Sci. Univ. of MO, Portageville.

Objectives and Relevance:

Phosphorus (P) is an essential plant nutrient because it is a structural element in nucleic acids (DNA and RNA), serves as an energy transfer element (ATP), and serves a critical role in cellular regulation, and carbon partitioning. Plants take up P as as inorganic ions ($H_2PO_4^-$ and HPO_4^{-2}) in the soil solution. In the soil, P is bound to clay particles and farmers may experience loss when soil particles are eroded into surface waters. Phosphorus leaching is generally considered very low unless the soil is coarse-textured or artificial drainage is present. The availability of P is usually affected by precipitation reactions which depend on the soil pH. Low pH soils, which are typical in Missouri, may cause P to react with Fe and Al which precipitate P and make P unavailable for plant uptake. At high pH (>8), precipitation of calcium phosphate compounds can also reduce P availability.

Fertilizer costs have challenged farmers to evaluate application rates and consider enhanced efficiency P applications or treatments. AVAIL® (Specialty Fertilizer Products, Leawood, KS) is a new stabilizer product for granular phosphate fertilizers including MAP, DAP, and other phosphate fertilizers. It was designed to reduce the impact of metals in the soil around the fertilizer granule on plant uptake, phosphate fixation, and allow phosphorus to be more available to the plant. This product primarily binds with calcium, iron, manganese, and aluminum to prevent precipitation of phosphorus. When applied to single crops, Blevins (2009) reported a 19 to 22 bu/acre increase in corn grain yields when AVAIL was added to MAP at 20 lbs P_2O_5/acre and applied as a broadcast or banded treatment while Dunn (2009) reported increased Bray-P1 phosphorus availability and a 4 bu yield increase in soybean after applying 50 lbs P_2O_5 with AVAIL. Similarly, rice yields increased 8 bu/acre when reduced rates of triple super phosphate were applied (25 lbs P_2O_5) with AVAIL. In addition, banded applications of P may also increase P efficiency (Minor et al., 1993). Phosphorus placement in the rooting zone of moist soil was suggested to improve efficiency if farmers desired to apply reduced rates. Strip till applications may limit P loss if soil particles were eroded into surface waters. Limited research has evaluated AVAIL and strip-till applications of phosphorus in a corn and soybean rotation in Missouri. These enhanced efficiency fertilizer technologies may synergistically benefit P use efficiency in Missouri.

The objectives of this research are to:

1. evaluate the effect of P placement, rate, and P stabilizer on grain yield and P uptake in a corn-soybean rotation, and
2. determine the effect of P source, P stabilizer, and ag lime on grain yield and P uptake in a corn-soybean rotation.

Procedures:

- A two-year rotational crop study will utilize P fertilizer applications for corn and evaluate the subsequent impact on soybean yield and/or uptake.
- The study will be arranged as a randomized complete block design with four replications at each site.
- Research to accomplish Objective 1 will be conducted at Novelty and Albany.
    - Strip-till equipment is currently available at both locations.
    - Treatments will include a factorial arrangement of application placement (surface broadcast or strip-till), MAP rate (0, ½ recommended rate, and recommended rate), and the presence or absence of AVAIL.
    - Potash will be included in all treatments as recommended.
    - A balance of ammonium nitrate fertilizer will be included for all treatments to balance the N contribution of MAP in the recommended rate treatment.
    - Tissue and grain P uptake will be determined at both locations for both crops.
- Research to accomplish Objective 2 will be conducted at Portageville and Novelty.
    - Treatments will include a factorial arrangement of a P source (non-treated control and a broadcast application of DAP or TSP (triple super phosphate)), presence or absence of AVAIL, and broadcast surface application of ag lime (0 and recommended rate).
    - Incorporation following application will be left to the discretion of the individual researcher at each site.
    - Tissue and grain P uptake will be determined at both locations.
- Soils will be initially characterized for soil organic C, pH (0.01 M $CaCl_2$), and exchangeable K, Ca and Mg at each site. Soil test P (Bray P1) concentrations will be determined prior to application from each replication at each site. Soil test P will be determined following soybean harvest at each treatment for objective 1 while soil test P and pH will also be determined for each treatment for objective 2.

Current Status and Importance of Research:

Several strategies exist for increasing soil P availability for plant growth including selection of the P fertilizer source and the method of application. Use of AVAIL may improve efficiency of applied P fertilizer, but its effectiveness has not been tested with different application methods or under different soil pH in Missouri. This research will help farmers determine the cost-effectiveness of stabilized P fertilizer when applied at recommended and ½ recommended rates as well as the impact of P fertilizer placement and soil pH on corn and soybean grain yields and plant P nutrition.

Expected Economic Impact of the Project:

If increased yields from enhanced efficiency P applications could increase average annual state corn yields 20 bu/acre and soybean yields 4 bu/acre with a 10% rate of adoption, This may add up to $39 million to the economy of Missouri.

Timetable:

2010

March	Soil sampling
April	Corn planting for the 2010/2011 trials
July	Tissue sampling
September	Harvest and grain sample for P for corn
December	Submission of annual report

2011

March	Soil sampling
April/May	Soybean planting in 2010 trial
April	Corn planting for the 2011/2012 trials
July	Tissue sampling
September	Harvest and grain sample P for corn and soybean
Oct/Nov	Soil sample from all treatments following soybean harvest
December	Submission of annual report

2012

March	Soil sampling
April/May	Soybean planting
July	Tissue sampling
September	Harvest and grain sample P for soybean
Oct/Nov	Soil sample from all treatments following soybean harvest
December	Submission of final report

Strategy for Application/Transfer of Knowledge:

Transfer of knowledge will be mainly via written and oral educational programs, including press releases, newsletter articles, radio interviews, television interviews, and conferences. On-site field days will provide a forum for farmers and agriculture professionals to learn about on-going research results.

References:

Blevins, D. 2009 Missouri Corn. Online at http://www.chooseavail.com/research.aspx?region=midwest. Accessed Nov. 11, 2009.

Dunn, D. 2009. Missouri Rice. Online at http://www.chooseavail.com/research.aspx?region=midwest. Accessed Nov. 11, 2009.

Dunn, D. 2009. Missouri Soybeans. Online at http://www.chooseavail.com/research.aspx?region=midwest. Accessed Nov. 11, 2009.

Minor, H. C., J. Stecker, and J.R. Brown. 1993. Phosphorus in Missouri Soils. Univ. of MO Ext., G9180.

Proposed Budget:

CATEGORIES	Year 2010	Year 2011	Year 2012	Total
A. Salaries Technical assistance or graduate research assistant (50%)	$13,823	$14,382	$14,670	$42,875
B. Fringe Benefits Fringe for graduate student	$1,990	$1,995	$2,095	$6,080
TOTAL SALARIES AND FRINGE BENEFITS	$15,813	$16,377	$16,765	$48,955
C. Travel Travel to field site To present research findings at National Meetings	 $0 $0	 $0 $0	 $0 $1000	 $0 $1000
TOTAL TRAVEL COSTS	$0	$0	$1000	$1000
D. Equipment	$0	$0	$0	$0
TOTAL EQUIPMENT use and maintenance COSTS	$0	$0	$0	$0
E. Other Direct Costs Soil analysis Grain analysis Tissue analysis Field supplies Publication cost Off-site PI's (2)	 $1380 $2560 $2560 $500 $0 $6,000	 $1680 $2560 $2560 $500 $0 $6,000	 $1020 $2560 $2560 $500 $500 $6,000	 $4080 $7680 $7680 $1500 $500 $18,000
TOTAL OTHER DIRECT COSTS	$13,000	$13,300	$13,140	$39,440
TOTAL REQUEST	**$28,813**	**$29,677**	**$30,905**	**$89,395**

Budget narrative:
Salaries and fringe benefits: Funds are requested for partial support of a research technical support and/or graduate research assistant.
Presentations, publications, and documentation: This will help defray cost of publication and documentation of results and conclusions as well as assist travel and board for presentation of results
Other Direct Costs: Covers cost of analysis, sample containers, fertilizer, seed, plot preparation, planting, weed control harvesting, flags, and other field supplies and operations.

RESUME. OF KELLY A. NELSON

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Novelty, MO 63460 — http://aes.missouri.edu/greenley/research/index.stm

EDUCATION

- Ph.D. Crop and Soil Sciences, Dep. of Crop and Soil Sci., Michigan State Univ. (2000)
- M.S. Crop and Soil Sciences, Dep. of Crop and Soil Sci., Michigan State Univ. (1997)
- B.S. Plant Science, Dep. of Agronomy, Univ. of Missouri (1995)

APPOINTMENTS

- Research Agronomist & Associate Professor, Univ. of Missouri, Novelty, MO (2007-present)
- Research Agronomist & Assistant Professor, Univ. of Missouri, Novelty, MO (2000-2006)
- Graduate Research Assistant, Michigan State Univ., East Lansing, MI (1995-2000)
- Teaching Assistant, Michigan State Univ., East Lansing, MI (1996)

OTHER EXPERIENCE

- Research Technician, Ciba Crop Protection, Lee's Summit, MO (1994)
- Integrated Pest Management, Gypsy Moth Technician, Univ. of Missouri, Columbia, MO (1992)
- Crop and Livestock Production Assistant, Nelson Farms, Skidmore, MO (1980-1995)

HONORS AND AWARDS

- ASABE Blue Ribbon Award, Circular Publication, Questions and answers about drainage water management for the Midwest, American Society of Agricultural and Biological Engineers (2007)
- Junior Faculty Award, Gamma Sigma Delta, Honor Society of Agriculture (2005)

SCHOLARLY SOCIETIES

- Sigma Xi
- Gamma Sigma Delta
- Honor Society of Phi Kappa Phi
- Golden Key National Honor Society
- Phi Eta Sigma Honor Society

PROFESSIONAL ORGANIZATIONS

- American Society of Agronomy
- Crop Science Society of America
- Weed Science Society of America
- North Central Weed Science Society of America

SERVICE

- North Central Regional Drainage Committee (NCR-207) (2003-present); Secretary 2008-2009; Chair 2009-2010
- Missouri Agriculture Leaders of Tomorrow Class XIII (ALOT) (2008-present)
- Missouri Livestock Symposium Committee (2001-present)
- Manuscript reviewer for eight peer-reviewed journals (2000-present)
- North Central Weed Science Society (1996-present); Membership Committee Chair (2006-2008)
- Weed Science Society of America (1996-present); Extension Committee(2001-2003)
- Missouri Wind Resources (2006-present)

PUBLICATIONS:

Nelson, K.A. and R.L. Smoot. 2010. Yellow nutsedge (*Cyperus esculentus*) interference in soybean (*Glycine max*). Weed Technol. *In press.*

Bailey, N.J., P.P. Motavalli, R.P. Udawatta, and K.A. Nelson. 2009. Soil CO_2 emissions in agricultural watersheds with agroforestry and grass contour buffer strips. Agroforest. Syst. 77:143-158. Online. doi:10.1007/s10457-009-9218-x.

Nelson, K.A., S.M. Paniagua, and P.P. Motavalli. 2009. Effect of polymer coated urea, irrigation, and drainage on nitrogen utilization and yield of corn in a claypan soil. Agron. J. 101:681-687.

Noellsch, A.J., P.P. Motavalli, K.A. Nelson, and N.R. Kitchen. 2009. Corn response to conventional and slow-release nitrogen fertilizer across a claypan landscape. Agron. J. 101:607-614.

Nelson, K.A., P.P. Motavalli, and R.L. Smoot. 2009. Dried distillers grain as a fertilizer source for corn. J. Agric. Sci. 1:3-12.

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Motavalli, P. P. and K.A. Nelson. 2008. Use of enhanced-efficiency fertilizers for improved agricultural nutrient management: Introduction to the symposium. Online. Crop Management doi:10.1094/CM-2008-0730-01-PS.

Nelson, K. A., Scharf, P. C., Bundy, L.G., and Tracy, P. 2008. Agricultural management of enhanced-efficiency fertilizers in the north-central United States. Online. Crop Management doi:10.1094/CM-2008-0730-03-RV.

Nelson, K.A., G.E. Rottinghaus, and T.E. Nelson. 2007. Effect of lactofen application timing on yield and isoflavone concentration in soybean seed. Agron. J. 99:645-649.

Nelson, K.A., and P.P. Motavalli. 2007. Foliar potassium fertilizer sources affect weed control in soybean with glyphosate. Online. Crop Management doi:10.1094/CM-2007-0724-01-RS.

Fang, M., P.P. Motavalli, R.J. Kremer, and K.A. Nelson. 2007. Assessing changes in soil microbial communities and carbon mineralization in Bt and non-Bt corn residue-amended soils. Applied Soil Ecology 37:150-160.

Nelson, K.A. 2007. Glyphosate application timings in twin- and single-row corn (*Zea mays* L.) and soybean (*Glycine max* L.). Weed Technol. 21:186-190.

Nelson, K.A., W.G. Johnson, J.D. Wait, and R.L. Smoot. 2006. Winter annual weed management in corn (*Zea mays*) and soybean (*Glycine max*) and the impact on soybean cyst nematode (*Heterodera glycines*) egg population densities. Weed Technol. 20:965-970.

Donald, W.W., and K.A. Nelson. 2006. Practical changes to single-boom sprayers for zone herbicide application. Weed Technol. 20:502-510.

Nelson, K.A., P.P. Motavalli, and M. Nathan. 2005. Response of no-till soybean to timing of pre-plant and foliar potassium applications in a claypan soil. Agron. J. 97:832-838.

Mungai, N.W., P.P. Motavalli, R.J. Kremer, and K.A. Nelson. 2005. Differences in yields, residue composition, and N mineralization dynamics of Bt and non-Bt maize. Nutrient Cycling in Agroecosystems. 73:101-109.

Mungai, N.W., P.P. Motavalli, R.J. Kremer, and K.A. Nelson. 2005. Spatial variation of soil enzyme activities and microbial functional diversity in temperate alley cropping systems. Biol. Fertil. Soils. 42:129-136.

Donald, W.W., W.G. Johnson, and K.A. Nelson. 2004. Zone herbicide application controls annual weeds and reduces residual herbicide use in corn. Weed Sci. 52:821-833.

Donald, W.W., W.G. Johnson, and K.A. Nelson. 2004. In-row and between-row interference by corn (*Zea mays*) modifies annual weed control by postemergence residual herbicides. Weed Technol. 18:497-504.

Li, J., R.J. Smeda, K.A. Nelson, and F.E. Dayan. 2004. Mechanism of resistance to diphenyl ether herbicides in waterhemp (*Amaranthus rudis*). Weed. Sci. 52:333-338.

Resume of PETER P. MOTAVALLI

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EDUCATION:

Ph.D., 1989, Soil Fertility and Plant Nutrition — Cornell University, Ithaca, NY
M.S., 1984, Soil Fertility and Plant Nutrition — University of Wisconsin, Madison, WI
B.S., 1982, Agronomy — University of Wisconsin, Madison, WI
B.S.F.S., 1978, Foreign Service — Georgetown University, Washington, DC

RESEARCH, EXTENSION AND TEACHING EXPERIENCE:

University of Missouri, Columbia, MO (Mar., 1999 – present). Associate Professor of Soil Nutrient Management in the Dept. of Soil, Environmental and Atmospheric Sci., School of Natural Resources.

University of Guam, Mangilao, GU (Aug., 1994 – Mar., 1999). Associate Professor of Soil Science in the Agricultural Experiment Station, College of Agriculture and Life Sciences.

Colorado State University, Ft. Collins, CO and North Carolina State University, Raleigh, NC (Feb., 1992 - Jul., 1994). Post-doctoral fellow at the Natural Resource Ecology Laboratory at Colorado State University and Department of Soil Science at North Carolina State University.

SELECTED PUBLICATIONS

Bailey, N.J., P.P. Motavalli, R.P. Udawatta, and K.A. Nelson. 2009. Soil CO_2 emissions in agricultural watersheds with agroforestry and grass contour buffer strips. Agroforest. Syst. 77:143-158. Online. doi:10.1007/s10457-009-9218-x.

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Noellsch, A.J., P.P. Motavalli, K.A. Nelson, and N.R. Kitchen. 2009. Corn response to conventional and slow-release nitrogen fertilizer across a claypan landscape. Agron. J. 101:607-614.

Nelson, K.A., P.P. Motavalli, and R.L. Smoot. 2009. Dried distillers grain as a fertilizer source for corn. J. Agric. Sci. 1:3-12.

Veum, K.S., K.W. Goyne, P.P. Motavalli, and R.P. Udawatta. 2009. Runoff and dissolved organic carbon loss from a paired-watershed study of three adjacent agricultural watersheds. Agric. Ecosys. and Environ. 130:115-122.

Unger, I.M., P.P. Motavalli, and R.M. Muzika. 2009. Changes in soil chemical properties with flooding: A field laboratory approach. Agric. Ecosys. and Environ. 131:105-110.

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Goyne, K.W., H.J. Jun, S.H. Anderson, and P.P. Motavalli. 2008. Phosphorus and nitrogen sorption to soils in the presence of poultry litter-derived dissolved organic matter. J. Environ. Qual. 37:154-163.

Unger, I., R.M. Muzika, P.P. Motavalli, and J. Kabrick. 2008. Evaluation of continuous *in situ* monitoring of soil changes with varying flooding regimes. Comm. Soil Sci. Plant Anal. 39:1600-1619.

Kim, H., J.W. Hummel, K.A. Sudduth, and P.P. Motavalli. 2007. Simultaneous analysis of soil macronutrients using ion-selective electrodes. Soil. Sci. Soc. Am. J. 71:1867-1877.

Nelson, K. A., and Motavalli, P. P. 2007. Foliar potassium fertilizer sources affect weed control in soybean with glyphosate. Online. Crop Management doi:10.1094/CM-2007-0724-01-RS.

Pengthamkeerati, P., P.P. Motavalli, R.J. Kremer, and S. H. Anderson. 2006. Soil compaction and poultry litter effects on factors affecting nitrogen availability in a claypan soil. Soil Tillage Res. 91:109-119.

Udawatta, R.P., P.P. Motavalli, H.E. Garrett, and J.J. Krstansky. 2006. Soil nitrogen losses in runoff from three adjacent agricultural watersheds with claypan soils. Agric. Ecosys and Environ. 117:39-48.

Mungai, N.W. and P.P. Motavalli. 2006. Litter quality effects on soil carbon and nitrogen dynamics in temperate alley cropping systems. Applied Soil Ecology 31:32-42.

Pengthamkeerati, P., P.P. Motavalli, R.J. Kremer, and S. H. Anderson. 2005. Soil carbon dioxide efflux from a claypan soil affected by surface compaction and applications of poultry litter. Agric. Ecosys and Environ. 109:75-86.

Mungai, N.W., P.P. Motavalli, R.J. Kremer, and K.A. Nelson. 2005. Spatial variation of soil enzyme activities and microbial functional diversity in temperate alley cropping systems. Biol. Fertil. Soils 42:129-136.

Jung, W.K., N. R. Kitchen, K. A. Sudduth, R. J. Kremer, and P. P. Motavalli. 2005. Relationship of apparent soil electrical conductivity to claypan soil properties. oil Sci. Soc. Am. J. 69:883-892.

Stevens, W.E., T. Gladbach, P.P. Motavalli and D. Dunn. 2005. Soil calcium-magnesium ratios and lime recommendations for cotton. J. Cotton Sci. 9:65-71.

Udawatta, R.P., P.P. Motavalli, and H.E. Garrett. 2004. Phosphorus loss and runoff characteristics in three adjacent agricultural watersheds with claypan soils. J. Environ. Qual. 33:1709-1719.

Motavalli, P.P, w.e. Stevens, and G. Hartwig. 2003. Remediation of subsoil compaction and compaction effects on corn N availability by deep tillage and application of poultry manure in a sandy-textured soil. Soil Tillage Res. 71:121-131.

Motavalli, P.P., S.H. Anderson, and P. Pengthamkeerati. 2003. Surface compaction and poultry litter effects on corn growth, nitrogen availability, and physical properties of a claypan soil. Field Crops Research 84:303-318.

Motavalli, P.P., S.H. Anderson, P. Pengthamkeerati, and C.J. Gantzer. 2003. Use of soil cone penetrometers to detect the effects of compaction and organic amendments in claypan soils. Soil Tillage Res. 74:103-114.

Motavalli, P. P. and R. J. Miles. 2002. Soil phosphorus fractions after 111 years of animal manure and fertilizer applications. Biol Fertil Soils 36: 35-42.

PROFESSIONAL ORGANIZATIONS:

Soil Science Society of America
American Society of Agronomy

SELECTED AWARDS AND FELLOWSHIPS:

2000 - present Adjunct Assistant Professor, Division of Plant Sciences, Univ. of Missouri
2001 - 2006 Member of Editorial Board, Journal of Plant Nutrition
2002 - 2003 New Faculty Teaching Scholar, University of Missouri
2003 Junior Faculty Research Award, Gamma Sigma Delta
2003 Chair of USDA Regional Committee on Soil Organic Matter (NCR 59)
2004 Outstanding Teaching Award, CAFNR, Univ. of Missouri
2004 Chair of Environmental Quality Division (A-5), Amer. Soc. of Agronomy
2008 Associate Editor, Soil Science Society of America Journal
2009 Maxine Christopher Shutz Award for Distinguished Teaching, University of Missouri

Resume of Bruce Burdick

Professional Experience

University of Missouri **2001-2007**

Superintendent, Hundley Whaley Research Center, Albany, MO **2003-2007**

Responsible for the management of the center research and operations. Serves as the principal investigator on research projects on the center. Projects have included soil fertility, seed traits, variety testing, herbicide testing, and other corn and soybean agronomic studies.

Research Associate / Project Manager **2001-2003**

Designed Implemented and monitored field trials evaluating yield and other agronomic traits of potential transgenic corn lines. Located and secured cooperators and subcontractors throughout the United States to conduct studies. Monitored status of each site throughout the year.

BASF Corporation – Research Triangle Park, NC **1981-2000**

Senior Field Biologist, 1995-2000
Senior Technical Development Representative 1990-1995
Senior Market Development Representative, 1985-1990
Market Development Representative, 1981-1985

Provided technical support and training in $40 million five state Midwest sales region. Generated new product research and development, together with discovery and expansion of new marketing areas for existing product line. Selected activities included data analysis and summarization, technical information writing, technical presentations to growers and industry professionals, complaint and contract research negotiations, field trial design and implementation, small plot research and larges scale sales demonstrations.

Resume of Manjula V. Nathan
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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- todate: Extension Associate Professor/ Director of Soil Testing & Plant Diagnostic Laboratories – University of Missouri, Columbia, MO
1994- to 2007 Extension Asssitant 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
- 2002: Honored Member of "Who Is Who in Agriculture Higher Education" (WWAHE).

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)
- External Grant Reviewer for US and Canadian Federal Funding Organizations (USDA: 2003- to date; USDE-FIPSE 2002-2003; and CAAS: 1992-1995).
- 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)
- National Science Foundation Graduate Fellowship Panelist (2001 – 2003; 2005, 2006)

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)

- Soil Testing and Plant Analysis Committee of SSSA - S 877 (2003 – to date)

Publications

Refereed

1. Nathan. M. V., Sun, Y. and P. C. Scharf. 2009. Evaluation of Modified Mehlich and Sikora Buffer Methods as an Alternative to Modified Woodruff Buffer in Determining Lime Requirement for Missouri Soils. Submitted for publishing in Special Edition of Communications in Soils and Plant Analysis.
2. Nelson, K. A.., Motavalli, P. P., and M. Nathan. 2005. Response to No-Till Soybean [Glycine max (L.) Merr.] to Timing of Preplant and Foliar Potassium Applications in a Claypan Soil. In Agron. J. 97:832-838.
3. Mottavalli, P. P., J. Lory, M. Nathan and C. Fulcher. 2002. Increased access to soil and plant testing database: Opportunities and Issues. Commun. In Soil Sci. and Plant Anal. 33: 1157 – 1171.

Book chapters:

1. Nathan, M. 2005. Reagents and Standards. Chapter 5. *In* Quality Assurance and Quality Control Model Plan for Soil Testing Laboratories. Soil Science Society and Oregon State University Publication. P 14-17
2. Combs, S. M. and M. V. Nathan. 1998. Soil Organic Matter. *In* Recommended Chemical Soil Test Procedures for North Central Region. Ed. J. R. Brown. Chapter 12:53-58. Missouri Ag. Expt. Station SB 1001, University of Missouri-Columbia

Abstracts:

1. Nathan, M. V., Sun, Y. and P. C. Scharf. 2009. Grain Nutrient Removal Values for Corn, Soybeans and Wheat. Annual Meetings Abstract. ASA, SSSA, CSSA Madison, WI.
2. Nathan. M. V., Sun, Y. and P. C. Scharf. 2009. Evaluation of Modified Mehlich and Sikora Buffer Methods as an Alternative to Modified Woodruff Buffer in Determining Lime Requirement for Missouri Soils. International Symposium on Soil and Plant analysis. Santa Rosa, CA. July 20-24, 2009. Abstracts. P. 80.
3. Nathan, M. V. , Sun, Y., Abernathy, S., and D. Dunn. 2007. Summary of Soil Fertility Status in Missouri by County, Soil Regions and Cropping Systems 1996 – 2006. Annual Meetings Abstract. ASA, SSSA, CSSA Madison, WI.
4. Nathan, M. V. 2007. Evaluation of Soil pH Buffers for Determining Lime Requirement in North Central Region. Soil and Plant Analysis Workshop Proceedings Abstracts. North Central Extension & Research Activity 13 Group publication.
5. Nathan, M. V., Scharf, P., and Y. Sun. 2006. Evaluation of Mehlich Buffer as an Alternative to the Woodruff Buffer for Lime Recommendations in Missouri. Annual Meetings Abstract. ASA, SSSA, CSSA Madison, WI.
6. Nelson, K., Motavalli, P., and M. Nathan. 2003. Response of No-till Soybean to Timing of Pre-plant and Foliar Potassium applications in a Clay Pan Soil. Annual Meetings Abstract. ASA, SSSA, CSSA. Madison, WI.
7. Nathan, M. V., Mallarino, A., Eliasan, R and R. Miller. 2002. ICP vs. Colorimetric Determination of Mehlich III Extractable Phosphorus. International Symposium on Soil & Plant Analysis. Edmonton, Alberta, Canada. Commun. Soil Sci. Plant Anal. 33:2432.
8. Nathan, M. Starbuck, C. and Y. Sun. 2001. Making recommendations Based on Laboratory Analysis of Compost: Science or Art? Annual Meetings Abstract. ASA, SSSA, CSSA. Madison, Wisconsin.

Miscellaneous Publications:

1. Reinbott, T., Nathan, M. Nelson, K. and R. Kremer. Nutrient Management in Biofuel Crop Production. 2009. Greenley Memorial Research Center, 2009 Field Day Report. P. 84-86.
2. Nathan, M., Kallenbach R., Nelson, K., Dunn. D and T. Reinbott. 2009. Greenley Memorial Research Center, 2009 Field Day Report. P. 87-91.

3. Nathan, M. V. 2009. Quality Assurance for Soil Testing Labs. Soil Testing and Plant Analysis Workshop Proceedings. North Central Extension and Research Activity Group 13. Feb 25, 2009. Bettendorf, IA.
4. Nathan, M.., Sun, Y., and D. Dunn. 2009. Nutrient removal Values for Major Agronomic Crops in Missouri. Report for 2008. In: Missouri Soil Fertility and Fertilizers Research Update 2008. Agronomy Miscellaneous Publ. #09-01, College of agriculture, Food and Natural Resources, University of Missouri. P 96- 105.
5. Nathan, M and T. Reinbott. 2008. Liquid Fertilizer Amino Terra Natural Foliar Bio-stimulant (NSBS) Validation Study Report submitted to Funding Agency Pacific Star A.A. in Chile Nov 19, 2008.
6. Nathan, M., Sun, Y., and D. Dunn. 2008. Summary of soil fertility status in Missouri by county, soil region and cropping systems. Progress Report-2007. In: Missouri Soil Fertility and Fertilizers Research Update 2007. Agronomy Miscellaneous Publ. #08-01. College of Agriculture, Food and Natural Resources, University of Missouri. p. 115-127.
7. Nathan, M., Sun, Y., and D. Dunn 2008. Nutrient Removal Values for Major Agronomic Crops in Missouri. Report for 2006-2007. *In*: Missouri Soil Fertility and Fertilizers Research Update 2007. Agronomy Miscellaneous Publ. #08-01, College of Agriculture, Food and Natural Resources, University of Missouri. P 128-144.
8. Nathan, M., Sun, Y., and D. Dunn 2007. Nutrient Removal Values for Major Agronomic Crops in Missouri. *In*: Missouri Soil Fertility and Fertilizers Research Update 2006. Agronomy Miscellaneous Publ. #07-01, College of Agriculture, Food and Natural Resources, University of Missouri. P 100-107.
9. Nathan, M., Scharf, P. Sun, Y., and D. Dunn. 2007. Evaluation of Modified Mehlich Tests for Determining Lime Requirement in Missouri Soils (2005-2006). *In*: Missouri Soil Fertility and Fertilizers Research Update 2006. Agronomy Miscellaneous Publ. #07-01, College of Agriculture, Food and Natural Resources, University of Missouri. P 94-99.
10. Scharf, P., Miles, R., and M. Nathan. 2007. P and K Fixation by Missouri Soils. *In*: Missouri Soil Fertility and Fertilizers Research Update 2006. Publ. #07-01, College of agriculture, Food and Natural Resources, University of Missouri. P 84- 90.
11. Nathan, M., Scharf, P. and Y. Sun. 2006. Evaluating Mehlich III extractants for Available Nutrients for Missouri Soils using Inductively Coupled Plasma Spectrometry. *In*: Missouri soil Fertility and Fertilizers Research Update 2005. Agronomy Miscellaneous Publ. #06-01, College of agriculture, Food and Natural Resources, University of Missouri. P101-108.
12. Nathan, M., Scharf, P. and Y. Sun. 2006.Comparison of Woodruff Buffer and Modified Mehlich buffer Tests for Determining Lime requirement in Missouri Soils. *In*: Missouri soil Fertility and Fertilizers Research Update 2005. Agronomy Miscellaneous Publ. #06-01, College of agriculture, Food and Natural Resources, University of Missouri. P 109-113.
13. Nelson, K.A., P.P. Motavalli, and M. Nathan. 2004. The impact of foliar potassium fertilizer source on crop response and weed control in a no-till "weed and feed" glyphosate-resistant soybean production system. pp. 149-155. Vol. 21. Proceedings of the 2004 Fluid Forum, Scottsdale, AZ.
14. Nelson, K., P.P. Motavalli, and M. Nathan. 2004. The impact of foliar potassium fertilizer source on crop response and weed control in a no-till "weed and feed" glyphosate-resistant soybean production system. pp. 70-75. 2004 Field Day Report of the Greenley Memorial Research Center. University of Missouri, Novelty, Missouri.

Extension Presentations and Publications

Field Days Presentations:

1. Scharf, P., Nathan, M. and R. Massey. 2009. P and K Nutrient Management for Grain Production. Crop Injury Diagnostic Clinic. Bradford Research and Extension Center, University of Missouri Columbia. July 28-31, 2009.
2. Nathan, M and N. Brandt. 2008. How can the MU Soil and Plant diagnostic Service Lab help the Horticulture Co-op? Horticulture Co-op Professional Landscape Association Field Day. St. Louis Community College at Meramec Horticulture Display Gardens, St. Louis, MO. Sept 11, 2008.
3. Nathan, M. and S. Wright. 2008. Services Offered by the MU Soil Testing and Plant Diagnostic Service Labs for Nursery and Landscape Industry. Missouri Landscape and Nursery Association Field Day. Forest Keeling Nursery, Missouri. June 26, 2008.
4. Nathan, M. and S. Wright. 2008. Soil Testing and Plant Diagnostic Services Available to Missourians. Greater Kansas City Home, Flower, Lawn and Garden Show. March 27-30. Bartle Hall, Kansas City, MO.

5. Nathan, M. Wright. S., and R. Heinz. 2008. Services Available at the MU Soil Testing and Plant Diagnostic Laboratories for Missourians. 2008. Mid Missouri Home and Garden Show. Hearnes Center, University of Missouri, Columbia. Feb 29 –March 1, 2008.
6. Nathan, M. 2006. Importance of Submitting Representative Soil and Plant Samples from Golf Courses for Analyses in Golf Course Nutrient Management. Turf Grass Field Day, South Farm, University of Missouri, Columbia, Missouri. July 11, 2006.
7. Nathan, M., Wright. S., and R. Heinz. 2005. Soil Fertility and Nutrient Deficiency in a Drought Year. MU Soil Testing and Plant Diagnostic Services. Huntley Whaley Filed Day Presentation, University of Missouri, Albany, Missouri. Sept 8, 2005.
8. Nathan, M., Wright. S., and R. Heinz. 2005. Services Available at the MU Soil Testing and Plant Diagnostic Laboratories. Greenley Filed Day Poster Presentation, University of Missouri, Novelty, Missouri. August 4, 2005.
9. Nathan, M. 2005. How can the MU Soil & Plant Diagnostic Labs help the turf Industry in meeting the diagnostic needs? and Submitting a good sample for diagnostics. Turf Grass Field Day, South Farm, University of Missouri, Columbia, Missouri. July 13, 2005
10. Nathan, M., Wright. S., and R. Heinz. 2004. MU Soil Testing and Plant Diagnostic Services Available for Clients. Huntley Whaley Filed Day Poster Presentation, University of Missouri, Albany, Missouri. Sept 8, 2004.
11. Nathan, M., Wright. S., and R. Heinz. 2004. MU Soil Testing and Plant Diagnostic Services Available for Clients. Graves Filed Day Poster Presentation. University of Missouri, Corning, Missouri. Aug. 24, 2004

Program Implementation Experience and In Service Training

1. Nathan, M., Crocker, D, Scharf, P and J. Lory, 2005. Soil Test Interpretations and Recommendations and Diagnostic Services. In Service Education Training for Regional Specialists, Agricultural Extension Program, University of Missouri. February 2, 2005.
2. Nathan, M. 2003. Soils, Plant Nutrition, and Soil Testing. Train the Trainers Master Gardner PDE. Oct 16, 2003.

Workshops, Conferences, Short Courses and Certified Crop Advisor Training:

1. Nathan, M. 2009. Quality Assurance for Soil Testing Labs. North Central Region Soil Plant analyst Workshop Proceedings, pp. 59-64. Feb 24-25, 2009. Bettendorf, IA.
2. Nathan, M., Soil Testing Fundamentals. 2008. NRCS Nutrient Management Certification Training, Columbia, MO. April 23, 2008
3. Nathan, M., Rehm. G. Eliason, R., Godsey, C., and D. Mengel. 2007. Evaluation of Soil pH Buffers for Determining Lime Requirement in North Central Region. Soil & Plant Analyst Workshop. February 27, 2007. Bettendorf, IA.
4. Nathan, M., Soil Testing Fundamentals. 2005. NRCS Nutrient Management Certification Training, Columbia, MO. March 29, 2005
5. Nathan. M. 2004. Why Test Soil? Better Lawns and Gardens. Children Gardening Educational Conference. Spink Pavilion, Missouri Botanical Gardens. St. Louis, MO. April 26, 2004
6. Nathan, M., Soil Testing Fundamentals. 2004. NRCS Nutrient Management Certification Training, Columbia, MO. March 16, 2004

Extension Guides and Fact Sheets:

1. Nathan, Manjula and Brad Freesenburg. 2008. Soil Testing for Lawns. MU Extension Guide G 6954. Revised Aug. 2008
2. Nathan, Manjula. 2008. Soils, Plant Nutrition and Nutrient Management. In: Master Gardener Core Manual. Published by MU Extension, University of Missouri
3. Nathan, M., 2005. Steps in Fertilizing Garden Soil: Vegetables and Annual Flowers. Extension Publication G 6950. University of Missouri Extension Publications.
4. Nathan, M., J. Stecker, E. Ervin, L. Jett, M. Warmund and P. Scharf. 2005. Commercial Fruits, Vegetables and Turf Soil Test Interpretations and Fertilizer Recommendation Guide (Electronic Publication).
5. Nathan, M. and B. Fresenburg. 2004. Soil Testing for Lawns. MU Guide G6954. University of Missouri Extension Publications

6. Nathan, M., Stecker, J., and Y. Sun. 2001. Soil Testing Guide. University of Missouri Soil Testing Lab Publication. (Electronic Publication).

Resume of WILLIAM E. (GENE) STEVENS

EDUCATION

Mississippi State University	PhD	1992	Agronomy
University of Tennessee-Knoxville	M.S.	1982	Plant and Soil Science
Union University	B.S.	1979	Biology and Journalism

EMPLOYMENT AND PROFESSIONAL EXPERIENCE

1994-Present	Crop Production Specialist, Plant Science Div., University of MO, Columbia, MO
1990-1994	Soil Scientist, Agronomy, MS State University/Crop Simulation, Starkville, MS.
1984-1990	Research Associate, North MS Branch Expt. Station, Holly Springs, MS

SERVICE AND AWARDS

2002-Present	Rice Technical Work Group, Executive Committee
2002-Present	MU-CAFNR, Chairman, Professional Track Faculty Committee
2006-Present	MU-Plant Science Division, Promotion and Tenure Committee
2007	Co-chair Southern Plant Nutrition Planning Committee
2006	Pyeontaek, South Korea Agricultural Assessment Team
2001	Innovation in Agribusiness Award, Monsanto Company
1998	Conservation Partnership Award, Natural Resource Conservation Service

PUBLICATIONS DURING THE LAST FIVE YEARS

Stevens, G., A. Wrather, M. Rhine, D. Dunn, and E. Vories. Predicting rice yield response to midseason nitrogen with plant area measurements. Agron. J. *Accepted*.

Dunn, D. and G. Stevens. Response of rice yields to phosphorus fertilizer rates and polymer coating. Crop Management. *Accepted.*

Nelson, K., P. Scharf, G. Stevens, and B. Burdick. Rescue nitrogen for corn. Agron. J. *In Review*.

Stevens, G., D. Dunn, and S. Hefner. 2007. Building soil potassium and phosphorus in a low-testing fescue field. Better Crops with Plant Food. International Plant Nutrition Inst. Vol. 91, Issue 4:20-21.

Stevens, G., E. Vories, M. Mulesky, M. Rhine, and D. Dunn. 2007. Irrigation to maximize vaccine antigen production in a genetically-modified tobacco. Agron. J. 99:1271-1277.

Dunn, D. and G. Stevens. 2007. Phosphorus management in a dry-seeded delayed-flood rice production system. Better Crops with Plant Food. International Plant Nutrition Inst. Vol. 91, Issue 1:20-21.

Aide, M., C. Aide, D. Dunn, and G. Stevens. 2006. Fragipan genesis in the eastern Ozarks of Missouri. Soil Sci. 171(6):483-491.

Shannon, J.G., W. E. Stevens, W. J. Wiebold, R. L. McGraw, and D. A. Sleper. 2005. Breeding soybeans for improved tolerance to flooding. Proc 35th Soybean Seed Research Conf. Am. Seed Trade Assoc. Chicago, IL. 7 Dec.

Stevens, G., T. Gladbach, P. Motavalli, and D. Dunn. 2005. Soil calcium and magnesium ratios and lime recommendations for cotton. J. Cotton Science. 9:65-71.

Conley, S., G. Stevens, and D. Dunn. 2005. Grain sorghum response to row spacing, crop density, and planter skips. Crop Management. [Online] doi:10.1094/CM-2005-0718-01-RS. http://www.plantmanagementnetwork.org

Wrather, J., W. Stevens, D. Dunn, R. Cartwright, G. Sciumbato, and D. Beighley. 2005. Tillage effects on stand and yield in a rice monoculture system. Crop Management [Online] doi:10.1094/CM-2005-0103-01-RS. http://www.plantmanagementnetwork.org

Dunn, D., G. Stevens, and A. Kendig. 2005. Boron fertilization of rice with soil and foliar applications. Crop Management. [Online] doi:10.1094/CM-2005-0210-01-RS. http://www.plantmanagementnetwork.org

Dunn, D., and G. Stevens. 2005. Rice potassium research progress. Better Crops with Plant Food. International Plant Nutrition Inst. Vol. 89, Issue 1: 15-17.

Stevens, G. and D. Dunn. 2004. Fly ash as a liming material on cotton. J. Environmental Quality 33: 343-348.

Stevens, W.E., S.A. Berberich, P.A. Sheckell, C.C. Wiltse, M.E. Halsey, M.J. Horak, and D.J. Dunn. 2004. Optimizing pollen confinement in corn grown for regulated products. Crop Science. 44: 2146-2153.

Wrather, J. A., D. A. Sleper, and W. E. Stevens. 2004. Soybean cultivar and foliar fungicide effects on *Phomopsis* sp. seed infection. Plant Disease. 721-723.

Dunn, D. A. Wrather, W. Stevens, M. Kenty, D. Beighley and M. Aide. 2004. Measuring K^+ in rice basal stem sap with a Cardy meter. Crop Management. [Online] doi:10.1094/CM-2004-1006-01-RS. http://www.plantmanagementnetwork.org

Beighley, D., W. Mueller, M. Aide, D. Dunn, and G. Stevens. 2004. Growth effects of corn in rotation with rice. Proc. Missouri Acad. of Science 38:8-14.

Wrather, J. A., D. A. Sleper, W. E. Stevens, J.G. Shannon, and R.F. Wilson. 2003. Planting date and cultivar effects on soybean yield, seed quality, and *Phomopsis* sp. seed infection. Plant Disease. 87:529-532.

Motavalli, P., W. Stevens, and G. Hartwig. 2003. Remediatation of subsoil compaction by deep tillage and application of poultry manure in a sandy-textured soil. Soil and Tillage Research. 71:121-131.

Wrather, J.A., W.E. Stevens, T.L. Kirkpatrick, and N.R. Kitchen. 2002. Effects of site-specific application of aldicarb effects on cotton yield in a *Meloidogyne incognita*-infested field. J. Nematology. 34 (2): 115-119.

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

Lab Tech II, Soil Testing Lab 1991-1997
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.

Lab Tech II, Power Plant 1985-1991
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.

PROFESSIONAL SERVICE:

1998- present University of Missouri Soil Testing Lab Advisory Committee.

1997- present University of Missouri Soil Test Recommendations Review Committee.

1997- present University of Missouri Soil Fertility Working Group.

1999-2001 Editor of Missouri Rice Research Update.

PROFESSIONAL SOCIETY MEMBERSHIPS:

American Society of Agronomy

Soil Science Society of America

Rice Technical Work Group

RECENT PUBLICATIONS:

Refereed Publications:

Dunn, D, and G Stevens. 2007, Phosphorus Management in a Dry-seed, Delayed Flood Production System in Missouri, Beter Crops International, (in press)

Aide, M., C. Aide, D. Dunn, and G. Stevens. 2006. Fragipan genesis in the eastern Ozarks of Missouri. Soil Science. 171: (in press)

Stevens, G., T. Gladbach, P. Motavalli, and D. Dunn. 2005. Soil calcium and magnesium ratios and lime recommendations for cotton. J. Cotton Science. 9:65-71.

Dunn, D., G. Stevens, and A. Kendig. 2005. Boron fertilization of rice with soil and foliar applications. Crop Management. [Online] doi:10.1094/CM-2005-0210-01-RS http://www.plantmanagementnetwork.org/pub/cm/research/2005/boron/

Conley, S., G. Stevens, and D. Dunn. 2005. Grain sorghum response to row spacing, crop density, and planter skips. Crop Management. doi:10.1094/CM-2005-0718-01-RS.

Wrather, J., W. Stevens, D. Dunn, R. Cartwright, G. Sciumbato, and D. Beighley. 2005.

Tillage effects on stand and yield in a rice monoculture system. Crop Management [Online] doi:10.1094/CM-2005-0103-01-RS
http://www.plantmanagementnetwork.org/pub/cm/research/2005/tillage/

Dunn, D., and G. Stevens. 2005. Rice potassium research progress. Better Crops. No. 1, pg. 15-17.

Agricultural Bulletins and Extension Publications:

D. Dunn, G. Stevens, Beighley, D. 2005. Sulfur Fertilization of Rice. Missouri Rice Research Update. Dexter, Mo, 16 Feb. pg 25-28.

Stevens, G. and D. Dunn. 2005. University of Missouri soil test recommendations for rice production. Missouri Rice Research Update. Dexter, Mo, 16 Feb. pg 10-11.

Dunn, D. and G. Stevens. 2005. P and K fertilization of water-seeded rice. Missouri Rice Research Update. Dexter, Mo, 16 Feb. pg 12-14.

D. Dunn. 2005. Comparison of Avail Coated and
Non-coated Super Triple Phosphate Fertilizers for Rice
Missouri Rice Research Update. Dexter, Mo, 16 Feb. pg 18-24.

Stevens, G., P. Motavalli, P. Scharf, M. Nathan, and D. Dunn. 2002. Crop nutrient deficiencies and toxicities, Integrated Pest Management Plant Protection Program, IMP1008

Crop Management Computer Programs:

Stevens, G., R. Massey, and D. Dunn. 2000. NITROMAX- program for maximizing economic returns on nitrogen fertilizer. University of Missouri Commercial Agric. Program and Ext./Outreach. Avail. at http://agebb.missouri.edu/commag/crops/fert/nitro/index.htm (Verified 18 Jul. 2002).

Stevens, G., D. Reinbott, R. Massey, and D. Dunn. 2001. PROFITMETER-interactive program for calculating cropping system costs. University of Missouri Commercial Agric. Program and Ext./Outreach. Avail. on diskettes.

Invited Presentations:

Stevens,G., and D. Dunn. 2006. Soil fertility research at the University of Missouri-Delta Research Center. Proc. Southern Plant Nutrition Mananagement Conf., 3-4 Oct. Olive Branch, MS, pg. 39-56.

Stevens,G., and D. Dunn. 2005. Soil fertility research at the University of Missouri-Delta Research Center. Proc. Southern Plant Nutrition Mananagement Conf., 4-5 Oct. Olive Branch, MS, pg. 100-116.

Peter Clifton Scharf

Education

Degree	*Date*	*Institution*	*Major*
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

Professional Experience

2002 to present *Associate Professor* in the Agronomy Department of the University of Missouri. Responsible for applied research and extension in the area of nutrient management.

1995 to 2002 *Assistant Professor* in the Agronomy Department of the University of Missouri.

Areas of Interest

- field-specific, soil-specific, and variable-rate fertilizer recommendations
- minimizing environmental impacts of agricultural practices
- optimizing crop management

Skills

- ability to communicate effectively, to cooperate with others, and to manage projects and people
- outstanding laboratory, field, project design, and data analysis skills
- excellent natural science background

Sample Research Publications

Scharf, Peter C. and William J. Wiebold. 2003. Soybean yield responds minimally to nitrogen applications in Missouri. Online. Crop Management doi:10.1094/CM-2003-1117-01-RS.

Scharf, Peter C., John P. Schmidt, Newell R. Kitchen, Kenneth A. Sudduth, S. Young Hong, John A. Lory, and J. Glenn Davis. 2002. Remote sensing for N management. J. Soil Water Cons. 57:518-524.

Scharf, Peter C., William J. Wiebold, and John A. Lory. 2002. Corn yield response to nitrogen fertilizer timing and deficiency level. Agron. J. 94:435-441.

Scharf, Peter C. 2001. Soil and plant tests to predict optimum N rates for corn. J. Plant Nutr. 24:805-826.

Sample Extension Publications

Scharf, Peter. 2003. Nitrogen prices are up again: How should that affect management decisions? Integrated Pest and Crop Management 13:25-26.

Scharf, Peter, Kevin Bradley, Shawn Conley, and Bill Wiebold. 2003. Risk of atrazine carryover damage to wheat and soybean. Integrated Pest and Crop Management 13:140.

Scharf, Peter and John Lory. 2003. Calibrating corn color from aerial photographs to predict sidedress nitrogen need. Crop Decisions Jan/Feb 2003 p. 26-28.