

Bill Raun

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Birthplace: Minden, Nebraska, June 21, 1957
Marital Status: Married, Tanya Colclasure Raun
Children: Anne Colclasure Raun, November 3, 1993
Katharine Smith Raun, June 7, 1995
Christopher Nathan Raun, April 16, 1998
Dana Lin Raun, January 14, 2001
Foreign Language: Fluent in Spanish

EDUCATION

Ph.D. University of Nebraska, Lincoln, Nebraska
Dissertation Chairmen: Professor R.A. Olson and Dr. D.H. Sander
Major Field: Agronomy/Soil Science
Allied Fields: Statistics
Date: December 1985

M.S. Oklahoma State University, Stillwater, Oklahoma
Thesis Chairman: Dr. R.L. Westerman
Major Field: Agronomy/Soil Fertility
Date: December 1982

B.S. Oklahoma State University, Stillwater, Oklahoma
Major Advisor: Dr. W.W. Huffine
Major Field: Agronomy/Turf Management
Date: May 1979

PROFESSIONAL EXPERIENCE

Sep. 2010-present: Walter R. Sitlington Chair in Agriculture

June 2009-Aug. 2010: Nutrients for Life Professorship in Plant and Soil Sciences

June 2006-May 2009: Melvin and Mary Jones Distinguished Professorship of Agronomic Sciences

June 2004-present: Regents Professor, Plant and Soil Sciences, Oklahoma State Univ.

June 1999-May 2004: Professor, Plant and Soil Sciences Dept., Oklahoma State Univ.

June 1996-May 1999: Associate Professor, Plant and Soil Sciences Dept., Oklahoma State Univ.

Dec. 1991-May 1996: Assistant Professor, Plant and Soil Sciences Dept., Oklahoma State Univ.

Responsibilities: Plan, budget, design and implement field and laboratory research in soil fertility and plant nutrition for M.S. and Ph.D graduate students. Develop sensor-based technologies for increased grain yields and nitrogen use efficiency in cereal crops. Continuous coordination of > 110 field experiments per year (short and long-term) addressing nutrient use efficiency in wheat, corn, alfalfa, cotton, switchgrass, sorghum, soybeans, and bermudagrass. Environmentally safe fertilization for cereal production, evaluation of alternative production practices, and characterization of N transformations in soils. Teaching graduate level 'soil plant nutrient cycling and environmental quality' and junior-senior level 'topics in precision agriculture', national and international project

proposals for outside funding, and supervision of field and laboratory experiments conducted by graduate students.

June 1987-November 1991: Maize staff regional agronomist, CIMMYT, based in Guatemala City, Guatemala. Responsibilities: Developmental assistance via national programs in Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Dominican Republic, Haiti and Cuba. Management of budget, distributed by project in nine countries. Coordination of agronomic research trials with 41 national program representatives. Research in maize/legume production systems, planning of projects, recommendations for future research needs, implementation of experiments and agronomy/statistics training. Coordination of Central America Maize National Program Committee. **Co-founder of Agronomía Mesoamericana**, ISSN 1021-7444, 1990-v.1-present, agronomic journal in Central America for the advancement of agricultural sciences, published biannually in Spanish (abstract in English). Also, preparation of



science bulletins in Spanish relative to applied nutrients in tropical soils. Senior editor of the proceedings 'Manejo de Suelos Tropicales en Latinoamérica', technical editing and final preparation of 57 research articles pertaining to management of tropical soils (North Carolina State University).

December 1985-May 1987: Post-doctoral fellow, CIMMYT Wheat Program, based both in Texcoco, and Ciudad Obregon, Mexico. Responsibilities: Consulting on soil-related problems for wheat production, formal course training in soil fertility and statistics, research plot work in soil fertility, statistical analysis of agronomy program experiments, team interaction with bread wheat, durum wheat, triticale, wide crosses and cytogenetics

programs within CIMMYT.

January 1983-December 1985: Research assistantship, Department of Agronomy, University of Nebraska-Lincoln. Responsibilities: Research plot work, statistical analysis of various project experiments, maize and wheat plant tissue analysis, soil test correlation and calibration with plant tissue data and teaching for Professor R. A. Olson and Dr. D. H. Sander.

January 1981-December 1982: Research assistantship, Department of Agronomy, Oklahoma State University. Responsibilities: Research plot work on soil fertility experiments conducted throughout the state of Oklahoma, statistical and laboratory analysis for Dr. R. L. Westerman.

TEAM LEADERSHIP

2008-present: Team development of a new-age hand-planter for the third world capable of planting single seeds and by-plant placement of N fertilizer.

1992-present: Since joining OSU, worked with a large multidisciplinary group of scientists to develop the GreenSeeker sensor-based variable N rate fertilization system that increases nitrogen use efficiency by 15% in winter wheat and corn.

1991-present: Senior or co-PI on grants totaling >\$8,100,000 from various competitive sources including USDA, Georgia-Pacific, USAID, NASA, OCAST, NRI, Farmland Industries, Potash Phosphate Institute, the Noble Foundation, and non-competitive funding.

1992-present: Coordinator of the Soil Fertility Research and Education Advisory Board, and that includes Administration and Annual Reporting on OK Senate Bill 314, \$265,000/year.

1992-present: Major advisor for 57 completed graduate degrees (40 M.S., 17 Ph.D.). Currently advise 8 graduate students. Supervisor and research coordinator for 5 part time employees.

1987-1991: Successfully worked with National Program research leaders in 8 Central American countries to formally establish *Agronomia Mesoamericana*, Spanish agronomic journal for the advancement of agricultural sciences.

CAREER GOALS

- To deliver affordable agricultural production technologies to farmers around the world that improve input use efficiencies.
- To refine sensor based technologies capable of increasing cereal grain yields and nutrient use efficiencies in the developed and developing world.
- To advance agronomic nutrient fertilization optimization algorithms (NFOA's) that can be employed by both advanced and resource poor farmers for improved nutrient use.
- Develop/refine **precision corn leaf orientation** systems that maximize light interception, optimize plant spacing and that increase corn grain yields



- Extend the use of foliar applied nutrients for in-season correction of nutritional needs, use of reduced tillage systems for soil conservation, and bed-planting systems for rainfed agriculture.
- Deliver affordable and functional NDVI sensors for use in determining fertilizer N rates in cereals
- Implement integrated agronomic research projects across scientific fields consistent with environmental concerns.
- Enhance team-oriented research projects that are the product of the researchers themselves who want to work together and who want to make a contribution to our world.

RESUME SUMMARY

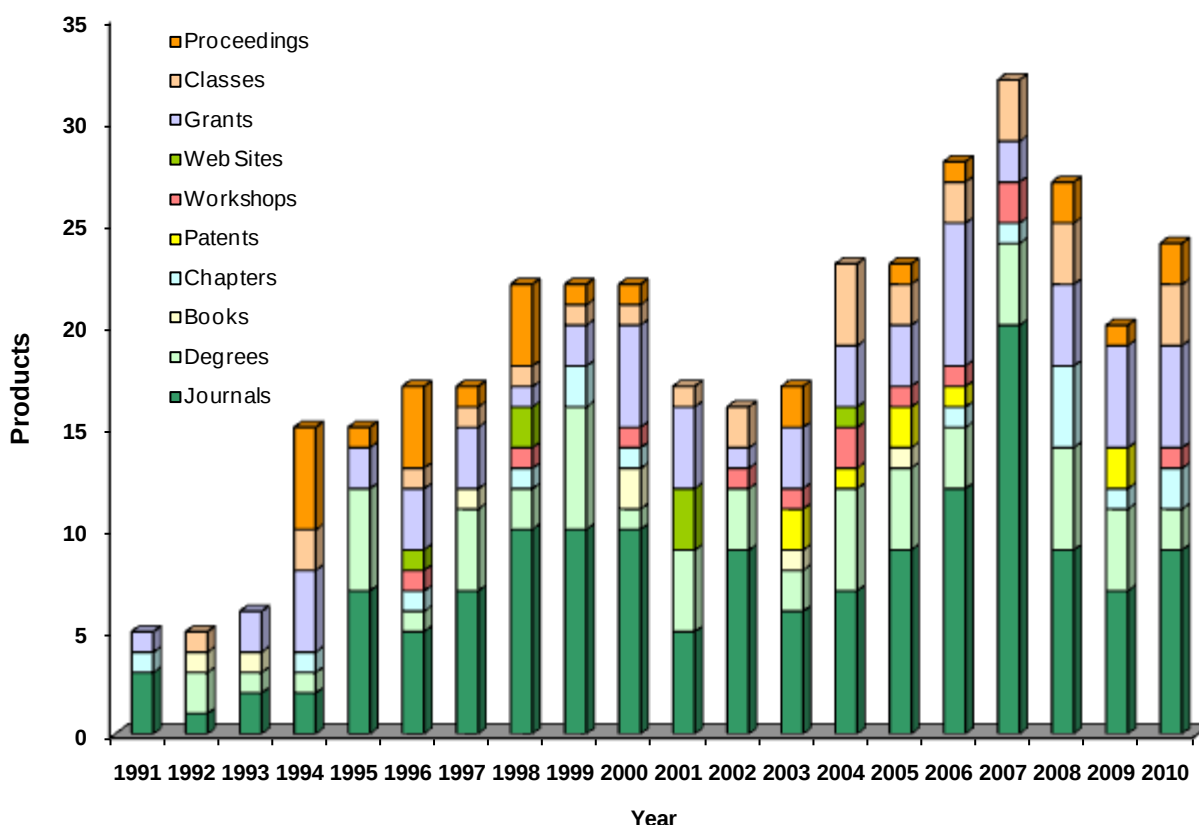
Publications	Total
Refereed Journal Publications	152
Books	2
Book Chapters	14
Patents	9
Proceedings	20
Popular Press, Departmental Books	30
Abstracts	226
Web Sites	8
Software Packages	1
Research Bulletins	28
CIMMYT Research Papers	9
Teaching	
Soil Plant Nutrient Cycling and Environmental Quality 5813	SP92, SP94, SP96, SP98, SP00, SP02, SP04, SP06, SP08, SP10 (avg. 17)
Senior Seminar 4571	FA94 (20)
Seminar 5020	SP94, FA94, SP95, SP05, FA05 (avg. 16)
Precision Agriculture 4213	SP97, SP99, SP01, SP02, SP03, SP04, SP06, SP07, SP08, SP10, SP11 (avg. 25)
Soil Nutrient Management 4234	FA04, FA05, FA06, FA07, FA08 (avg. 35)
Research Methods 5111	SP05, SP07, SP11 (avg. 12)
Total number of students (all classes)	720
Professional Invitations	
International Invitations, (paper required)	9(8)
National Invitations, (paper required)	14(8)
Conferred Graduate Degrees as Major Advisor (60 total graduates)	
Current M.S. and Ph.D. degrees in progress	8
Master of Science completed as Major advisor	43
Doctor of Philosophy completed as Major advisor	17
Total	64
Competitive Grants And Proposals (52)	
1989-present	\$8,205,614
International Student Travel	
Fully funded travel for faculty and graduate students traveling to Mexico, Uzbekistan, Kenya, Ethiopia, Zimbabwe, India, Turkey, Australia, Russia, and China to conduct sensor based N fertilization training with CIMMYT on short (1-week) and long-term (4 month) study.	88
Miscellaneous	
Years of service as Technical Editor, Agronomy J.	7
Years of service as Associate Editor, Agronomy J.	6
Field Days and Workshops Coordinated	8
International Workshops Coordinated	2
International Agronomic Networks Established	1
Committee Member	40
Board Member, public/private organizations	3
National & International Awards	15

CAREER HIGHLIGHTS and IMPACT 1985-present

- **1985:** Long-term trial that was initiated to evaluate residue management in spring wheat near Ciudad Obregon, Mexico is being continued today by CIMMYT staff
- **1987:** Legume interseeding trials started throughout Central America in a regional structure showed that *Vigna* spp could be grown under high shade within corn, thus decreasing soil erosion on marginal, highly sloping land.
- **1990:** Co-founder of **Agronomia Mesoamericana**, ISSN 1021-7444, agronomic journal in Central America for agricultural scientists
- **1992:** Initiated work with a multidisciplinary group (Engineering and Agronomy) to develop improved N fertilization for cereal crops
- **1993:** First to publish on the use and applications of stability analysis for interpreting treatment by environment interactions in agronomic experiments (Agron. J. 85:159).
- **1995:** Documented the presence of inorganic N buffering in wheat production that explained why NO₃-N leaching was limited in these environments (Agron. J. 87:827).
- Used tritium-helium water dating techniques to partition NO₃-N contamination into pre WWII and post WWII categories, consistent with the time (post WWII) when inorganic fertilizers were first used.
- **1996:** Published definitive data showing how spectral radiance measurements could be used for correcting in-season fertilizer N deficiencies in wheat. (Trans. ASAE 39:1623).
- **1997:** Consistent with work in corn documenting plant NH₃ losses, work in wheat showed that losses approached 40 kg N/ha at average yield levels. (J. Plant Nutr. 20:389).
- **1998:** Microvariability work showed significant differences in soil-test properties in agricultural fields at distances less than 0.5 m apart (Soil Sci. Soc. Am. J. 62:683)
- **1999:** Long-term application of high N rates in continuous winter wheat showed that soil organic C could be significantly increased (Soil Tillage Res. 47:323)
- Published comprehensive review manuscript documenting nitrogen use efficiencies for cereal production world wide at 33% (Agron. J. 91:357)
- **2000:** Showed that forage production systems has much higher N use efficiencies since the plant was not allowed to approach maturity when plant losses increased (J. Plant Nutr. 23:1505).
- **2001:** Showed that final wheat grain yield levels could be predicted from mid-season NDVI readings collected from winter wheat over various years and locations and that could be used for adjusting fertilizer N rates (Agron. J. 93:131).
- **NTech Industries** formally established, and a joint venture agreement was initiated with Oklahoma State University to deliver the **GreenSeeker** sensing and agronomic technologies to farmers around the world.
- **2002:** Using mid-season prediction of yield, the response index, and N adjustments based on these values, NUE's in wheat were increased by 15% over conventional practices (Agron. J. 94:815)
- Published comprehensive long-term trial work showing the value of using the response index as a guide for improved fertilizer N management (J. Plant Nutr. 26:249)
- **Sensor Based Nitrogen Rate Calculator** established on-line that includes 24 functional algorithms for various crops whereby farmers can obtain improved mid-season fertilizer recommendations (<http://www.soiltesting.okstate.edu/SBNRC/SBNRC.php>)
- **2003:** SOIL 5813 Class project results in the 4th "class project" to publish as a part of nutrient management instruction (J. Plant Nutr. 26:1561).
- Optical Sensing Nitrogen Management Group meets for the first time in Stillwater, OK. Focus on increased NUE for corn and wheat production included attendees from Oklahoma,

Nebraska, Missouri, Minnesota, Illinois, Kansas, North Dakota, Iowa, Mexico, Canada, Virginia, and Maryland.

- **2004:** Automated calibration stamp developed as an alternative to sensors for use in determining optimum fertilizer N rates (Agron. J. 97:338)
- **2005:** Comprehensive publication of components that comprise the crop nitrogen algorithm (Commun. Soil Sci. Plant Anal. 36:2759), and recorded US Patent 6,880,291.
- Documented plant to plant variability that exceeded 2780 kg/ha in corn production over 3 countries, and 7 states, further enhancing the need for precision sensing technologies that treat this variability (Agron. J. 97:1603)
- International Network for Improving NUE established (http://www.nue.okstate.edu/Nitrogen_Conference2003/2006_Regional_Trial.htm)
- Over **1000 N Rich Strips** established in farmer fields in Oklahoma on over 125,000 acres. Using the Sensor Based N Rate Calculator, a net profit exceeding \$10/acre has been realized for those farmers participating in this program.
- **2006:** NUE web site established in 1996 (www.nue.okstate.edu) receives its 70,000 hit, averaging 50 + per day. Site reports comprehensive information on how to improve nitrogen use efficiency in cereal production.
- Ramp Calibration Strip initiated to replace the calibration stamp for increased farmer adoption and improved N management in virtually all crops.
- **2007:** RAMP or N Rich Strips extended in over 2000 farmer fields with a service area exceeding 200,000 acres.
- 5th consecutive year, for Optical Sensing Nitrogen Management Group meeting, started in 2003, now hosted by Monsanto Co. Attendees have risen from 30 in 2003 to now over 75.
- **2008:** By-plant N fertilization strategy implemented in corn production systems that resulted in increased NUE.
- N Rich Strips adopted by Oklahoma Fertilizer Dealers throughout central and western portions of the state. Areas using the GreenSeeker sensor based N recommendations in many other regions in the US, and around the world have become extensive.
- OSU N fertilization methodology was fully endorsed by Dr. Norman Borlaug (1970 Nobel Peace Prize Recipient). Use of the OSU N fertilization approach in the US, and other parts of the world documented in various popular press sources (<http://www.nue.okstate.edu/International/GreenSeeker.htm>).
- **2009:** Published joint article with Dr. Norman Borlaug (CSA News, 54:21-22) on the importance of generational recommitment to education in the developing world. First iteration of the pocket sensor completed and tested. Seed orientation project initiated showing that leaf architecture could be controlled at planting.
- **2010:** Seed orientation at planting resulting in leaves perpendicular to the row (all plants) and increased corn grain yields. Development of seed orientation equipment initiated via a joint project with BAE. 67 NDVI Pocket Sensors, tested, with a new prototype now being used. Team development of new age hand planter for the third world.
- **2011:** Release of the Grain Protein Optimizer option on the Sensor Based Nitrogen Rate Calculator.



From 1991 to present our project has completed on average, **18 significant products per year**. Significant products that were summed for each year and reported above include [refereed journal publications](#), [graduate students receiving degrees](#), [books published](#), [chapters published](#), [patents issued](#), [workshops completed](#), [web sites developed](#), [grants obtained](#), [classes taught](#), and [proceedings published](#). Data reported above **does not** include popular press, abstracts, and extension bulletins. In addition, the planning matrix that we complete, update, and report each year includes outcome based goals, and a mechanism that ensures if funds were budgeted for a specific project, a completion document (publication, proceeding, etc.) was required. This has assisted in our being able to generate 1.5 significant products per month over a 20 year period.

JOURNAL PUBLICATIONS

1. Olson, R. A., W. R. Raun, Yang Shou Chun and J. Skopp. 1986. Nitrogen management and interseeding effects on irrigated corn and sorghum and on soil strength. Agron. J. 78:856-862.
2. Raun, W. R., D. H. Sander and R. A. Olson. 1986. Emergence of corn as affected by source and rate of solution fertilizers applied with the seed. J. of Fert. Issues. 3(1):18-24.
3. McCallister, D. L., C. A. Shapiro, W. R. Raun, F. N. Anderson, G. W. Rehm, O. P. Engelstad, M. P. Russelle and R. A. Olson. 1987. Rate of phosphorus and

potassium buildup/decline with fertilization for corn and wheat on Nebraska mollisols. *Soil Sci. Soc. Am. J.* 51:1646-1652.

4. Raun, W. R., R. A. Olson, D. H. Sander and R. L. Westerman. 1987. Alternative procedure for total phosphorus determination in plant tissue. *Commun. Soil Sci. Plant Anal.* 18:543-557.
5. Raun, W. R., D. H. Sander and R. A. Olson. 1987. Phosphorus fertilizer carriers and their placement for minimum till corn under sprinkler irrigation. *Soil Sci. Soc. Am. J.* 51:1055-1062.
6. Raun, W. R., D. H. Sander and R. A. Olson. 1989. Nitrogen fertilizer carriers and their placement for minimum till corn under sprinkler irrigation. *Agron. J.* 81:280-285.
7. Raun, W. R., H. J. Barreto, D. H. Sander and R. A. Olson. 1989. Frozen versus non-frozen sample preparation for plant tissue phosphorus analysis. *Commun. In Soil Sci. Plant Anal.* 20(1-2) 197-211.
8. Caceros, O.A., P. Gonzalez, I. Hidalgo, B. Moscoso and W.R. Raun. 1990. Ensayo exploratorio de métodos é interacciones de elementos en la aplicación de fertilizantes en el cultivo de maíz. *Agron. Meso.* 1:7-13.
9. Pierre, R., A. Robles, R. Celado, W.R. Raun and H.J. Barreto. 1990. Maize yield response to sulfur and phosphorus applied under different tillage systems in the Dominican Republic. *Sulphur in Agriculture, Volume 14*:16-19.
10. Raun, W. R., and R. L. Westerman. 1991. Nitrate-N and phosphate-P concentration in winter wheat at varying growth stages. *J. of Plant Nutr.* 14:267-281
11. Raun, W.R., and H.J. Barreto. 1991. Maize yield response as affected by sulfur, phosphorus and nitrogen as banded applications on a volcanic ash derived tropical soil. *Commun. In Soil Sci. and Plant Anal.* 22(15-16) 1661-1676.
12. Sosa, J.H., V.M. Mendoza, E.N. Ascencio, A.G. Alvarado, S. Bonilla and W.R. Raun. 1991. Efecto del calcio y azufre en el sistema maíz-frijol en ladera ante un nivel de nitrogeno y fósforo en El Salvador, 1989. *Agron. Meso.* 2:61-65.
13. Gordon, Roman, Andres Gonzalez, Jorge Franco, Nivaldo De Gracia, Adys de Herrera and William Raun. 1992. Evaluación de dosis y metodos de aplicación de azufre y su efecto residual en el cultivo de maíz en dos localidades de Azuero Panamá. *Agron. Meso.* 3:52-56.
14. Raun, W. R., H. J. Barreto, and R. L. Westerman. 1993. Use of stability analysis for long-term soil fertility experiments. *Agron. J.* 85:159-167.
15. Raun, W.R. and H.J. Barreto. 1993. Maize grain yield response to sulphur fertilization in Central America. *Sulphur in Agriculture, Volume 16*:26-30.

16. Westerman, R.L., R.K. Boman, W.R. Raun and G.V. Johnson. 1994. Ammonium and nitrate nitrogen in soil profiles of long-term winter wheat fertilization experiments. *Agron. J.* 86:94-99.
17. Guertal, E.A., W.R. Raun, R.L. Westerman and R.K. Boman. 1994. Applications of stability analysis for single-site, long-term experiments. *Agron. J.* 86:1016-1019.
18. Raun, W.R. and H.J. Barreto. 1995. Regional maize grain yield response to applied phosphorus in Central America. *Agron. J.* 87:208-213.
19. Sembiring, H., W.R. Raun, G.V. Johnson and R.K. Boman. 1995. Effect of wheat straw inversion on soil water conservation. *Soil Sci.* 159:81-89.
20. Boman, R.K., R.L. Westerman, W.R. Raun and M.E. Jojola. 1995. Time of nitrogen application: effects on winter wheat and residual soil nitrate. *Soil Sci. Soc. Am. J.* 59:1364-1369.
21. Boman, R.K., R.L. Westerman, W.R. Raun, and M.E. Jojola. 1995. Spring-applied nitrogen fertilizer influence on winter wheat and residual soil nitrate. *J. Prod. Agric.* 8:584-589.
22. Raun, W.R., and G.V. Johnson. 1995. Soil-plant buffering of inorganic nitrogen in continuous winter wheat. *Agron. J.* 87:827-834.
23. Johnson, G.V., and W.R. Raun. 1995. Nitrate leaching in continuous winter wheat: use of a soil-plant buffering concept to account for fertilizer nitrogen. *J. Prod. Agric.* 8:486-491.
24. Phillips, S.B., W.R. Raun and N.T. Basta. 1995. Use of reflectometry for determination of nitrate-nitrogen in well water. *J. of Plant Nutr.* 18:2569-2578.
25. Westfall, D.G., J.L. Havlin, G. Hergert and W.R. Raun. 1996. Nitrogen management in dryland cropping systems. *J. Prod. Agric.* 9:192-199.
26. Stone, M.L., J.B. Solie, W.R. Raun, R.W. Whitney, S.L. Taylor and J.D. Ringer. 1996. Use of spectral radiance for correcting in-season fertilizer nitrogen deficiencies in winter wheat. *Trans. ASAE* 39(5):1623-1631.
27. Altom, W., J.L. Rogers, W.R. Raun, G.V. Johnson and S.L. Taylor. 1996. Long-term rye-wheat-ryegrass forage yields as affected by rate and date of N application. *J. of Prod. Agric.* 9:510-516.
28. Solie, J.B., W.R. Raun, R.W. Whitney, M.L. Stone and J.D. Ringer. 1996. Optical sensor based field element size and sensing strategy for nitrogen application. *Trans. ASAE* 39(6):1983-1992.
29. Stone, Marvin L., John B. Solie, Richard W. Whitney, William R. Raun and Heather L. Lees. 1996. Sensors for detection of nitrogen in winter wheat. SAE Technical paper series. SAE Paper No. 961757. SAE, Warrendale PA.

30. Gavi, F., N.T. Basta and W.R. Raun. 1997. Wheat grain cadmium as affected by long-term fertilization and soil acidity. *J. Environ. Qual.* 26:265-271.
31. Boman, R.K., W.R. Raun, R.L. Westerman and J.C. Banks. 1997. Long-term nitrogen fertilization in short-season cotton: interpretation of agronomic characteristics using stability analysis. *J. Prod. Agric.* 10:580-585.
32. Taylor, S.L., G.V. Johnson and W.R. Raun. 1997. A field exercise to acquaint students with soil testing as a measure of soil fertility status and field variability. *J. Nat. Resour. Life Sci. Educ.* 26:132-135.
33. Kanampiu, F.K., W.R. Raun and G.V. Johnson. 1997. Effect of nitrogen rate on plant nitrogen loss in winter wheat varieties. *J. of Plant Nutr.* 20(2&3):389-404.
34. Gavi, F., W.R. Raun, N.T. Basta and G.V. Johnson. 1997. Effect of sewage sludge and ammonium nitrate on wheat yield and soil profile inorganic nitrogen accumulation. *J. of Plant Nutr.* 20(2&3):203-218.
35. Raun, William R., Gordon V. Johnson, Jeffery A. Hattey, Shannon L. Taylor and Heather L. Lees. 1997. Nitrogen cycle ninja, a teaching exercise. *J. Nat. Resour. Life Sci. Educ.* 26:39-42.
36. Phillips, S.B., W.R. Raun, and G.V. Johnson. 1997. Seasonal and long-term changes in well water nitrate-nitrogen. *J. Environ. Qual.* 26:1632-1637.
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39. Sembiring, H., G.V. Johnson and W.R. Raun. 1998. Extractable nitrogen using hot potassium chloride as a mineralization potential index. *J. Plant Nutr.* 21:1253-1271.
40. Sembiring, H., W.R. Raun and G.V. Johnson. 1998. Nitrogen accumulation efficiency: relationship between excess fertilizer and soil-plant biological activity in winter wheat. *J. Plant Nutr.* 21:1235-1252.
41. Sembiring, H., W.R. Raun, G.V. Johnson, M.L. Stone, J.B. Solie and S.B. Phillips. 1998. Detection of nitrogen and phosphorus nutrient status in winter wheat using spectral radiance. *J. Plant Nutr.* 21:1207-1233.
42. Raun, W.R., G.V. Johnson, S.B. Phillips and R.L. Westerman. 1998. Effect of long-term nitrogen fertilization on soil organic C and total N in continuous wheat under conventional tillage in Oklahoma. *Soil & Tillage Res.* 47:323-330.

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46. Taylor, S.L., W.R. Raun, J.B. Solie, G.V. Johnson, M.L. Stone, and R.W. Whitney. 1998. Use of spectral radiance for correcting nitrogen deficiencies and estimating soil test variability in an established bermudagrass pasture. *J. of Plant Nutr.* 21:2287-2302.
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48. Taylor, S.L., M.E. Payton and W.R. Raun. 1999. Relationship between mean yield, coefficient of variation, mean square error and plot size in wheat field experiments. *Commun. Soil Sci. Plant Anal.* 30:1439-1447.
49. Raun, W.R., G.V. Johnson, and R.L. Westerman. 1999. Fertilizer nitrogen recovery in long-term continuous winter wheat. *Soil Sci. Soc. Am. J.* 63:645-650.
50. Mullen, R.W., W.E. Thomason and W.R. Raun. 1999. Estimated increase in atmospheric carbon dioxide due to worldwide decrease in soil organic matter. *Commun. Soil Sci. Plant Anal.* 30:1713-1719.
51. Osborne, S.L., W.R. Raun, G.V. Johnson, J.L. Rogers, and Wadell Altom. 1999. Bermudagrass response to high nitrogen rates, source and season of application. *Agron J.* 91:438-444.
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9. Freeman, K.W., and W.R. Raun. 2007. Advances in nitrogen handling strategies to increase the productivity of wheat. p. 169-173. *In* H.T. Buck et al. (eds). Wheat production in stressed environments. Springer, AA Dordrecht, The Netherlands.
10. Raun, W.R., and J.S. Schepers. 2008. Nitrogen management for improved use efficiency. p.675-693. *In* J.S. Schepers and W.R. Raun (eds.) Nitrogen in agricultural systems. Agron. Monogr. 49. ASA, CSSA, SSSA, Madison, WI.
11. Meisinger, J.J., J.S. Schepers, and W.R. Raun. 2008. Crop nitrogen requirement and fertilization. p.563-612. *In* J.S. Schepers and W.R. Raun (eds.) Nitrogen in agricultural systems. Agron. Monogr. 49. ASA, CSSA, SSSA, Madison, WI.
12. Raun, William R., Ivan Ortiz-Monasterio, and John B. Solie. 2009. Temporally and spatially dependent nitrogen management for diverse environments. *In* Brett F. Carver (ed) Wheat: Science and Trade. Wiley-Blackwell Publishing: Chapter 10, 203-214.
13. Schepers, J.S., and W.R. Raun. 2010. Nitrogen sensors to fine tune the nutrient management decision making process. *In* Advances in Nitrogen Management for Water Quality, (eds) Jorge A. Delgado and Ronald F. Follett. Soil and Water Cons. Soc. Ankeny, IA. pp. 207-229
14. Girma, Kefyalew, and William Raun 2010. Nutrient and water use efficiency. *In* Jim Camberato (ed.) Handbook of Soil Science. CRC Press, Inc. Boca Raton, FL.

PATENTS

1. Raun, W.R., G.V. Johnson, J.B. Solie, and M.L. Stone. 2003. Process for in-season fertilizer nitrogen application based on predicted yield potential. US Patent No. 6,601,341 B2. Issued, August 5, 2003.

2. Stone, M.L., D. Needham, J.B. Solie, W.R. Raun, and G.V. Johnson. 2003. Optical spectral reflectance sensor and controller. US Patent No. 6,596,996 B1, Issued July 22, 2003.
3. Raun, W.R., G.V. Johnson, J.B. Solie, and M.L. Stone. 2004. A process for in-season fertilizer nitrogen application based on predicted yield potential. U.S. Patent. 10,195,138. (CIP of U.S. Patent 6,601,341).
4. Raun, W.R., G.V. Johnson, J.B. Solie, and M.L. Stone. April 19, 2005. A process for in-season fertilizer nitrogen application based on predicted yield potential. U.S. Patent. 6,880,291 B2, Issued, April 19, 2005.
5. Stone, M.L., D. Needham, J.B. Solie, W.R. Raun, and G.V. Johnson. 2005. Optical Spectral Reflectance Sensor and Controller. U.S. Patent. 6,855,933 B2, Cont. of 6,596,996, Issued Feb 15, 2005.
6. Raun, W.R., G.V. Johnson, J.B. Solie, M.L. Stone, K.W. Freeman. 2007. Use of within-field-element-size CV for improved nutrient fertilization in crop production. US Patent No. 7,188,450 B2. Issued, March 13, 2007.
7. Solie, J.B., M.L. Stone, W.R. Raun, 2009. Handheld optical sensor for measuring the normalized difference vegetative index in plants. Prov. Patent 61/219,053.
8. Solie, J.B., W.R. Raun, and A.D. Monroe. 2009. Method for variable rate nitrogen application for plants. Prov. Patent 61/219,057.
9. Solie, J.B., M.L. Stone, and W.R. Raun. 2010. Hand held optical sensor for measuring the normalized difference vegetative index in plants. Prov. Patent 12/820,669

SERVICE TO PROFESSIONAL SOCIETIES

SSSA Soil Science Society of America; **ASA** American Society of Agronomy

2010-present	Associate Editor, Agronomy Journal, ASA-SSSA-CSSA
2010-present	Associate Editor, Journal of Plant Nutrition
2001-2007	Technical Editor-Soils , Agronomy Journal, ASA-SSSA-CSSA (responsible for 12 Associate Editors and annually handled more than 80 manuscripts)
2003-2009	SSSA Rapid Response Team (S536.1)
2001-2004	SSSA Division S-8 Board Representative
1996-2001	Associate Editor, Agronomy Journal
2000-2001	Larson Hydro Memorial Scholarship Committee
1998-2000	ASA Membership Committee

PROFESSIONAL ACTIVITIES

International Plant Nutrition Institute (IPNI) Advisory Group, 2008

RESOURCE 21, Agriculture Advisory Board Member, Farmland Industries, 1997-1999
National Research Initiative Panel Member, USDA, Water Resources Assessment and Protection, 1995
National Research Initiative Panel Member, USDA/CSREES, WRAP, 1999
Member, Oklahoma Agribusiness Retailers Association (OARA), 1992-present
Farmland/University Fertilizer Advisory Board, 1992 - 2001
Advisor, Agronomy Graduate Student Organization, 1992 - 1995
National Research Council, Committee on Sustainable Agriculture for The Humid Tropics, 1990
Member of the American Association for the Advancement of Science, 1984
Member of the American Society of Agronomy, 1981-present
Member of the Soil Science Society of America, 1981-present
Member of the Crop Science Society of America, 2010-present

AWARDS

Pierre C. Robert Precision Agriculture Senior Scientist Award, 2010
Eminent Faculty Award, Oklahoma State University, 2009
ASA-CSSA-SSSA, Award of Excellence. Oklahoma Homeowner's Handbook for Soil and Nutrient Management (E-1003), 2009
Gamma Sigma Delta Experienced Research Scientist Award, 2009
Sarkeys Distinguished Professor Award, Oklahoma State University, 2007
Werner L. Nelson Award for Diagnosis of Yield-Limiting Factors, American Society of Agronomy, 2006
Melvin D. and Mary E. Jones Distinguished Professorship of Agronomic Sciences, 2006
Regents Distinguished Research Award, Oklahoma State University, 2004
United States Dept. of Agriculture Secretary's Honor Award, 2002 – GreenSeeker Research Team
Fellow, Soil Science Society of America, 2001
Fellow, American Society of Agronomy, 2000
Robert E. Wagner Award, Potash & Phosphate Institute, 1997
James A. Whatley Award, Oklahoma State University, 1996
Widaman Trust Distinguished Graduate Assistant, University of Nebraska, 1985
Gamma Sigma Delta, 1984
Sigma Xi, 1984

INTERNATIONAL WORKSHOPS

1. Raun, W.R., J.S. Schepers, G.V. Johnson, J.B. Solie, and M.L. Stone. 2003. Coordinated "Crop Nitrogen Algorithm Workshop" that included scientists from the USDA-ARS, Mexico, and Universities from Nebraska, Oklahoma, Kansas, Missouri, Virginia, and Colorado. May 19-20, 2003. Results from all presentations published simultaneously on the web, with a comprehensive summary.
http://nue.okstate.edu/Nitrogen_Conference2003/Planning_Session.htm
2. Schepers, J.S., J. Shanahan, G. Varvel, W. Wilhelm, N. Kitchen, W.R. Raun, and M.L. Stone. 2004. Coordinated "Crop Nitrogen Algorithm Workshop" that included

scientists from the USDA-ARS, and Universities from Nebraska, Texas, Kentucky, Illinois, Minnesota, Oklahoma, Kansas, Missouri, Idaho, Colorado, Arizona, Canada, , Mexico. August 5-6, 2004. Results from all presentations published simultaneously on the web.

http://nue.okstate.edu/Nitrogen_Conference2003/Planning_Session2004.htm

INTERNATIONAL NETWORK FOR IMPROVING NUE

1. The NUE network was first started in 2003 (Stillwater, OK). This international group has since met in 2004 (Lincoln, NE), 2005 (Columbia, MO), 2006 (Waseca, MN), 2007 (Monmouth, IL), 2008 (Manhattan, KS), 2009 (W. Lafayette, IN), 2010 (Stillwater, OK) and has resulted in a network of collaborating scientists that now includes groups from Argentina, Canada, Mexico, China, and the USA. A common treatment structure to be evaluated was established in order for all groups to validate and verify proposed N fertilization algorithms. This combined effort of more than 75 scientists working in nitrogen management will accelerate progress needed for improving nitrogen use efficiency using precision sensing technologies.

http://nue.okstate.edu/Conferences_Workshops.htm

FIELD DAYS and WORKSHOPS COORDINATED

1. Variable rate technology field day. PI's. Marvin Stone, John Solie, Richard Whitney, Bill Raun and Gordon Johnson. Conducted for research and industry groups involved in variable rate application of fertilizers. 107 people in attendance. Hennessey, OK, March 22, 1996.
2. Wheat Workshop. Jointly conducted with Gene Krenzer, Gordon Johnson, Bob Hunger, Tom Royer, and Roger Gribble for CCA advanced training using hands-on examples in management, entomology, pathology, soil fertility and weed management. Lahoma, OK, May 15, 1998.
3. Wheat 2000 Workshop. Jointly conducted with Gene Krenzer, Gordon Johnson, Bob Hunger, Tom Peeper, Jim Stritzke, Tom Royer, Ray Sidwell, and Aaron Guenzi for CCA advanced training using hands-on examples in management, entomology, pathology, soil fertility and weed management. Lahoma, OK, May 18, 2000.
4. CCA Hands-on Training, Jointly conducted with Gener Krenzer, Gordon Johnson, Bob Hunger, Tom Royer, Ray Sidwell, John Solie, Tom Peeper, and Case Medlin. For CCA advanced training using hands-on examples of precision agriculture, soil fertility, entomology, pathology, and weed management. Lahoma, OK, May 16, 2002.
5. Wheat 2004 Workshop, CCA Hands-on Training, Jointly conducted with Gene Krenzer, Gordon Johnson, Bob Hunger, Tom Royer, Ray Sidwell, John Solie, Tom Peeper, and Case Medlin. For CCA advanced training using hands-on examples of precision agriculture, soil fertility, entomology, pathology, and weed management. Lahoma, OK, May 20, 2004.
6. Sensor-Based N Rich Strip Workshop, Jointly conducted with John Solie, Marvin Stone, Kyle Freeman, Ross Love, and Carol Jones, for 35 attendees from Oklahoma, and Canada. Stillwater, OK January 11-12, 2005.
7. Sensor-Based N Rich Strip Workshop, Jointly conducted with John Solie, Marvin Stone, Kyle Freeman, Randy Taylor, Ross Love, Carol Jones, Hailin Zhang, and Jeff

Edwards for 65 attendees from Oklahoma, Michigan, Kansas, and Canada. Stillwater, OK, January 19-20, 2006.

8. RAMP and N Rich Strip Training of Ag Educators in Oklahoma and Kansas. Jointly conducted with Randy Taylor, John Solie, Ross Love, Hailin Zhang, and Jeff Edwards for 70 attendees. Stillwater, OK January 18-19, 2007.
9. Annual International NUE Conference, Stillwater, OK, Aug 4-5, 2010 (attended by 100 scientists from all over the world)

R&D RESULTS IN INDUSTRY

The first sensor-based N rate applicator was conceived, developed, tested, and shown at an OSU field day on March 22, 1996 (PI's John Solie, Marvin Stone, Bill Raun and Gordon Johnson). From 1996 to 1998, informal discussions were held with John Deere Co., Toro Equipment, and Case IH, concerning the commercial application of this work but no formal agreement was made. Our OSU precision sensing team initiated discussions with John Mayfield (future president of NTech Industries) in the fall of 1998. From 1998 to 2001, continued research and development of the sensor-based variable N rate applicator developed at OSU took place. On October 15, 2001, NTech Industries was formally established and a joint venture was signed with OSU concerning the sale of sensor based N rate applicators combined with continued R&D at OSU. NTech is now owned by Trimble which is actively selling the GreenSeeker™ Hand-held sensors and field scale variable N rate applications. Hand held sensors are now used in *Canada, Mexico, Ecuador, Argentina, China, India, Turkey, Australia, Uzbekistan, Russia, Zimbabwe, Kenya, Ethiopia, USA: Idaho, Maryland, Virginia, Nebraska, Kansas, Missouri, Colorado, Iowa, Minnesota, Ohio, North Carolina, North Dakota, Kentucky, Tennessee, Colorado, South Dakota, Texas, California, Illinois, and Oklahoma.*

WEB SITES DEVELOPED and MAINTAINED

1. Raun, W.R., J.B. Solie, D.B. Arnall, and M.L. Stone. 1996-present. Improving nitrogen use efficiency for winter wheat production. www.nue.okstate.edu. Okla. Agric. Exp. Sta. Stillwater, OK. (hits to date, >110,000)
2. Raun, W.R., R.L. Westerman and G.V. Johnson. 1998-present. Soil fertility research and education. www.dasnr.okstate.edu/fertilizer_checkoff. Okla. Agric. Exp. Sta. Stillwater, OK. (hits to date, 2530)
3. Raun, W.R., J.B. Solie, M.L. Stone, G.V. Johnson and R.W. Whitney. 1998-present. Precision agriculture in Oklahoma. www.dasnr.okstate.edu/precision_ag. Okla. Agric. Exp. Sta. Stillwater, OK. (hits to date, 12,405)
4. Raun, W.R., G.V. Johnson, E.G. Krenzer, W.E. Thomason, R. Hunger, T. Royer, R. Gribble, R. Sidwell, G. Cuperus, A. Goforth, J. Hise. 2000-2002. Wheat 2000 Workshop. www.dasnr.okstate.edu/wheat2000. Okla. Agric. Exp. Sta. Stillwater, OK.

5. Raun, W.R., G.V. Johnson, and R.L. Westerman. 2000-present. Soil plant nutrient cycling and environmental quality. <http://soil5813.okstate.edu>. Okla. Agric. Exp. Sta. Stillwater, OK.
6. Raun, W.R., J.B. Solie, G.V. Johnson, and M.L. Stone. 2000-present. Precision Agriculture, SOIL 4213. <http://soil4213.okstate.edu>. Okla. Agric. Exp. Sta. Stillwater, OK. (hits to data, 7454)
7. Raun, W.R., and D.B. Arnall. 2004-present. Soil Nutrient Management, SOIL 4234. <http://soil4234.okstate.edu>. Okla. Agric. Exp. Sta. Stillwater, OK. (hits to date, 4,473)
8. Raun, W.R. 2005-present. Research Methods in Plant and Soil Sciences, SOIL 5111. Okla. Agric. Exp. Sta. Stillwater, OK.
www.nue.okstate.edu/Research_Methods/Research.html

GRANTS AND PROPOSALS

1. Olson, R.A., W.R. Raun and D.H. Sander. 1983-85. Placement of phosphorus and nitrogen fertilizers for minimum till corn under sprinkler irrigation. Responsible for annual reports submitted to the Tennessee Valley Authority. Grant funded for \$32500.
2. Raun, W.R., D.H. Sander and R.A. Olson. 1984. Response of irrigated corn yields to nitrogen sources applied with a urease inhibitor. Grant funded by Allied Chem. Co., for \$2500 in 1984 and \$2500 in 1985.
3. Raun, W.R., 1988. Methods of applying sulfur for maize grown on volcanic ash derived soils in Central America. Submitted to The Sulphur Institute, February 1988. Grant funded for \$5000, November 1988, \$5000, November 1989 and \$5000, November 1990.
4. Raun, W.R., and T.J. Smyth. 1989. Phosphorus source and method evaluation for Central America. Submitted to Texasgulf Export Corporation, January, 1989. Grant funded, August, 1989 for \$55,000.
5. CRP-CIMMYT. 1991. Jointly obtained additional funding for the new agronomic journal 'Agronomía Mesoamericana' from the European Economic Community (\$80,000 for the period 1991-1994).
6. Basta, N.T., W.R. Raun, E.R. Allen, G.V. Johnson and M.P. Anderson. 1993. Impact of long-term cropping on cadmium in wheat and evaluation of agroecosystem Cd bioavailability indicators. Submitted to the OSU-Targeted Research Initiative, June 1, 1993 for \$7740. Grant funded, August, 1993.
7. Raun, W.R. and G.V. Johnson. 1993. Effect of timing of residue and fertilizer nitrogen incorporation on N use efficiency in winter wheat. Submitted to Farmland

- Industries Inc., November 18, 1993 for \$24,000. Funded for \$24000, February 9, 1994.
8. Raun, W.R., G.V. Johnson and R.K. Boman. 1994. Prediction of inorganic nitrogen buffering capacities in continuous cropping production systems. Submitted to OSU-Targeted Research Initiative, June 10, 1994 for \$11000. Funded for \$11000, July 7, 1994.
 9. Stone, M.L., J.B. Solie, R.W. Whitney and W.R. Raun. 1994. Precision real-time split application of nitrogen based on crop needs. Submitted to OSU-Targeted Research Initiative, June 10, 1994 for \$15100. Funded for \$15,100, July 7, 1994.
 10. Gillen, R.L., W.R. Raun and F.T. McCollum. 1994. Effects of grazing management on rangeland soils. Submitted to OSU-Targeted Research Initiative, June 10, 1994 for \$5,067. Funded for \$5067, July 7, 1994.
 11. Raun, W.R., and S.L. Taylor. 1994. Long-term rye-wheat-ryegrass forage yields as affected by rate and date of N application. Project analysis submitted to the Noble Foundation, January, 1994 for \$10000. Funded for \$10,000, September, 1994.
 12. Raun, W.R., and S.L. Taylor. 1995. Changes in soil test indices in a long-term rye-wheat-ryegrass forage production system as affected by rate and date of N application. Project analysis submitted to the Noble Foundation, February, 1995 for \$10,000. Funded for \$10,000, March, 1995.
 13. Westerman, R.L., G.V. Johnson and W.R. Raun. 1989 - present. Continuation of soil fertility research and education project, SB-314.
 14. Raun, W.R., G.V. Johnson, M.L. Stone, J.B. Solie, R.W. Whitney. 1995. Implementation of sensor based variable rate technology for bermudagrass production in south central Oklahoma, October, 1995 for \$100,000. Funded for \$100,000, November, 1995.
 15. Raun, W.R., G.V. Johnson and S.B. Phillips. 1996. Use of tritium/helium-3 groundwater dating in north-central Oklahoma well water. Submitted to Environmental Institute for Water and Energy Research, February, 1996. Funded for \$8925, April, 1996.
 16. Johnson, G.V., and W.R. Raun. 1996. Calibration of phosphorus fertilization for winter wheat forage production. Submitted to the Noble Foundation, February, 1996 for \$10,000. Funded for \$10000, May, 1996.
 17. Raun, W.R., J.B. Solie, G.V. Johnson, M.L. Stone, R.W. Whitney, H. Sembiring and H.L. Lees. 1996. Field element size for soil phosphorus and potassium in continuous production systems. Submitted to the Potash Phosphate Institute, September 1996. Funded for \$2000, December, 1996, \$2000 in 1997, \$2,000 in 1998.

18. Raun, W.R., M.L. Stone, J.B. Solie, G.V. Johnson and R.W. Whitney. 1997. Development of sensor-based technologies for detecting in-season nitrogen deficiencies in winter wheat and bermudagrass. Submitted to the Noble Foundation, February 1997. Funded for \$150,000, April, 1997.
19. Solie, J.B., M.L. Stone, R.W. Whitney, J. Baird, G.V. Johnson, W.R. Raun and K. Conway. 1997. Development of optical sensor based variable rate technology for turfgrass management. Submitted to John Deere and Co., February 1997. Funded for \$300,000, April, 1997.
20. Raun, W.R. and G.V. Johnson. 1997. Effect of Nitrogen Rate, Method of Application and Residue Management on N Use Efficiency and Estimated N Loss in Winter Wheat. Submitted to Farmland Industries Inc., May 1997 for \$16000. Funded for \$16,000, June 1997.
21. Raun, W.R., J.B. Solie and G.V. Johnson. 1998. Development of spectral indices to improve nitrogen use efficiency in wheat: Breaking the 50% use efficiency barrier. Submitted to International Research Support Program (IRSP), February, 1998, Funded for \$4,000, March, 1998.
22. Raun, W.R., and M.L. Stone. 1999. Continued development of spectral indices to predict yield potential and improve nitrogen use efficiency in wheat. Submitted to International Research Support Program (IRSP), February, 1999, Funded for \$4,000, March, 1999.
23. Stone, M.L., J.B. Solie, W.R. Raun and G.V. Johnson. 1999. Sensor-based, in-season estimated yield for winter wheat and bermudagrass. Submitted to the Noble Foundation, February 1999. Funded for \$50,000, April, 1999.
24. Johnson, G.V., A.R. Klatt, R.F. Elliott, M.L. Stone, J.B. Solie and W.R. Raun. Application of in-season estimated yield for variable rate nitrogen application. Submitted to the Noble Foundation, February 2000. Funded for \$175,000, April 2000.
25. Solie, J.B., M.L. Stone, R. Elliott, G.V. Johnson, A.R. Klatt and W.R. Raun. Field Scale Applicator and System for In-Season Fertilizer Nitrogen Application Based on Optically Sensed Predicted Yield. Submitted to the OSU Targeted Research Initiative Program, February 2000. Funded for \$20,000, April 2000.
26. Raun, W.R., J.B. Solie and A.R. Klatt. Continued Development of Spectral Indices to Predict Yield Potential and Improve Nitrogen Use Efficiency in Wheat. Submitted to the OSU International Research Support Program (IRSP), February 2000, Funded for \$4000, March, 2000.
27. Raun, W.R., J.B. Solie, M.L. Stone, G.V. Johnson, R. Elliott, A.R. Klatt, K.D. Sayre and M. Reynolds. System for In-Season Fertilizer Nitrogen Application Based on Predicted Yield. Submitted to the National Research Initiative (NRI) Competitive Grants Program, January 2000. Submitted for \$468,929, funded for \$382,000, December 1, 2000.

28. Smith, Michael W., W.R. Raun and G.V. Johnson. Nitrogen strategies to reduce pecan alternate bearing. Submitted to OCAST, spring 2000. Funded for \$80,656, June, 2000.
29. Raun, W.R., G.V. Johnson, J.B. Solie, M.L. Stone, K.D. Sayre, M.P. Reynolds, and S.B. Phillips. 2001. Field testing of a sensor-based applicator for nitrogen and phosphorus fertilization. Submitted to Application of Geospatial and Precision Technologies, NASA (CSREES, Cooperative State Research, Education, and Extension Services), Competitive Grants Program, March, 2001 for \$656,240, funded for \$575,000, September 1, 2001.
30. Schepers, J.S., J.F. Shanahan, D.D. Francis, K.H. Holland, W.R. Raun, G.V. Johnson, J.B. Solie, M.L. Stone, and Chunsheng Hu. 2003. Crop Sensor-Based Nitrogen Management to Protect Water Quality. Submitted to OICD for \$109,000, Funded for \$109,000, June, 2003.
31. Raun, W.R. and K.W. Freeman. 2003. Fall and Spring Applied Urea-N Sources for Winter Wheat Production. Submitted to Georgia-Pacific, September 2003 for \$23,800, funded for \$23,800, October, 2003.
32. Raun, W.R. Funding for Post-Doctoral Fellow, Agricultural Division. Submitted to the Noble Foundation, September 2003, Funded in April of 2004 for \$125,000.
33. Raun, W.R., G.V. Johnson, and R.L. Westerman. Soil Fertility Research and Advisory Board. Senate Bill 314, established in November of 1989 and initially established by Dr. Robert L. Westerman, total since 1989-present, \$3,738,833.
34. Raun, W.R., J.B. Solie, M.L. Stone, H. Zhang, J. Lamb, and G. Randall. 2004. Laser measured height and NDVI coefficient of variation for by-plant, real-time, variable nitrogen rate application in corn. Submitted to United States Dept. of Agric., NRI, for \$759,255, March, 2004.
35. Raun, W.R., J. Mosali, J.B. Solie, D. Redfearn, M.L. Stone, J. Ball, and W. Altom. 2004. Improving Bermudagrass Forage Pasture Production via Sensor Based Methods of Identifying Weed Species and Methods of Control. Submitted to the Noble Foundation, July 2004, Funded for \$37,500, August 2004.
36. Raun, W.R., K.D. Sayre, R. Gupta, J.B. Solie, M.L. Stone, K. Freeman, K. Martin, and I. Ortiz-Monasterio. 2004. Technological Extension of Sensor-Based Nitrogen Fertilization Algorithms for Increased Cereal Production and Use Efficiency. Submitted to USAID via CIMMYT, for \$185,613 August 2004, Funded for \$120,000, Jan 2005.
37. Raun, W.R., J.B. Solie, M.L. Stone, and H. Zhang. 2005. Sitlington Enriched Graduate Scholarship, Precision Agriculture By-Plant Methodology. Submitted for \$5000/year, 3 years, 2 students, funded for \$30,000, Feb, 2005.

38. Stone, M.L., W.R. Raun, J.B. Solie, H. Zhang, and G. Brown. 2005. Improved Nitrogen Fertilization and Use Efficiency for Wheat and Corn in Northern Italy. Submitted to Fondazione Cassamarca for \$25,000, July 2005.
39. Raun, W.R., J.B. Solie, M.L. Stone, and H. Zhang. 2006. Sitlington Enriched Graduate Scholarship, RAMP and New VRT Applicator. Submitted for \$5000/year, 3 years, 2 students, funded for \$30,000, Feb, 2006.
40. Brorsen, W., F. Epplin, J. Solie, and W. Raun. 2006. Economics of Precision Sensing Technologies in Oklahoma Wheat. TIP, OAES. Funded for \$27,392, January, 2006.
41. Taylor, R., B. Woods, R. Gribble, W. Raun, J. Solie, M. Stone, H. Zhang. 2006. Extension of the GreenSeeker Sensor Based Nitrogen Rate Recommendations for Corn and Wheat Farmers in Oklahoma. TIP, OAES. Funded for \$21,000, January, 2006.
42. Weckler, P., W. Raun, G. Bell, J. Solie, M. Stone, N. Maness, B. Morgan, R. Taylor. 2006. Development of laser-based biosensor technologies. TIP, OAES, Funded for \$50,000, January 2006.
43. Zhang, Hailin, and W.R. Raun. 2006. Extension of RAMP Technology for Improved N fertilization. Centennial Scholars Program, 21st Century Plant Enterprises. Funded for \$60,000, February 2006.
44. Raun, W., K. Freeman, B. Arnall, and R. Teal. 2006. Precision Sidedress UAN Application for Corn Production. Submitted to the Fluid Fertilizer Foundation for \$3000, Funded, February 2006.
45. Arnall, D.B., and W.R. Raun. 2006. Evaluation of foliar N sources for corn production. Submitted to Tesenderlo Kerley Co. for \$4000, funded for \$4000, March 2006.
46. Raun, W.R., J.B. Solie, R. Taylor, H. Zhang, and A. Sutherland. 2007. Relationship between fractional water indices from the Mesonet and estimated yield potential using mid-season Greenseeker readings. Sitlington Enriched Graduate Scholarships, submitted for \$5000/year, 3 years, 2 students, funded for \$30,000, Feb, 2007.
47. Raun, W.R., J.B. Solie, A. Sutherland, and R. Taylor. 2007. Real-Time Use of Mesonet Weather Data for Refined GreenSeeker Sensor Based N Recommendations in Winter Wheat. TIP, OAES-OCES. Funded for \$61,422, February 2007.
48. Wang, Ning, Chad Godsey, Hailin Zhang, Randy Taylor, Bill Raun, and John Solie. 2008. Smart field data acquisition system for precision agriculture. TIP, OAES-OCES. Funded for \$44,615, February 2008.
49. Raun, W.R., Ning Wang, Randy Taylor and John Solie. 2008. By-plant N fertilization strategy for corn production. Sitlington Enriched Graduate Scholarships, submitted for \$5000/year, 3 years, 2 students, funded for \$30,000, Feb, 2008.

50. Raun, W.R., J.B. Solie, M.L. Stone, R. Taylor, and D.B. Arnall. 2008. Development and delivery of the second generation optical pocket sensor for maximizing nitrogen use efficiency in cereal production systems. Oklahoma Conservation Commission. Funded for \$133,000, June 2008.
51. Arnall, D.B., W.R. Raun, D. Edmonds, Yumiko Kanke, and Brian Arnall. 2008. Evaluation of 521G43 and Nitamin 30L Foliar N Products for Winter Wheat Production. Funded for \$19,077, October, 2008.
52. Raun, W.R., D. Edmonds, D.B. Arnall, and Y. Kanke. 2009. Evaluation of 521G43 and Nitamin 30L Foliar N Products for Winter Wheat Production. Georgia Pacific. Funded for \$19,077, January 2009.
53. Raun, W.R., J.B. Solie, R.K. Taylor, M. Stone, D.B. Arnall, and N. Wang. 2009. Development and testing of the Optical Pocket Sensor. Sitlington Enriched Graduate Scholarships, submitted for \$5000/year, 3 years, 2 students, funded for \$30,000, Feb, 2009.
54. Raun, W.R., D.B. Arnall. 2010. Coordination of the 2010 NUE Workshop in Stillwater, OK. Support for \$1500 sought from Monsanto, Co., Funded for \$1500, January 2010.
55. Raun, W.R., D.B. Arnall. 2010. Coordination of the 2010 NUE Workshop in Stillwater, OK. Support for \$1000 sought from Bayer Crop Science., Funded for \$1500, January 2010.
56. Raun, W.R., D.B. Arnall. 2010. Coordination of the 2010 NUE Workshop in Stillwater, OK. Support for \$2000 sought from Trimble., Funded for \$1000, January 2010.
57. Raun, W.R., D.B. Arnall. 2010. Coordination of the 2010 NUE Workshop in Stillwater, OK. Support for \$1500 sought from Ag Leader., Funded for \$1500, January 2010.
58. Raun, W.R., D.B. Arnall. 2010. Coordination of the 2010 NUE Workshop in Stillwater, OK. Support for \$2000 sought from John Deere., Funded for \$1000, February 2010.
59. Raun, W.R., R.K. Taylor, N. Wang. 2011. Use of measured stalk diameter for improved prediction of yield. Sitlington Enriched Graduate Scholarships, submitted for \$5000/year, 3 years, 2 students, funded for \$30,000, Feb, 2011.

COMPETITIVE GRANT TOTAL (1985-present):	\$3,213,871
LEGISLATIVE GRANT TOTAL (1989-present):	\$5,023,243
GRANT TOTAL, all sources:	\$8,235,114

TEACHING AND SOFTWARE DEVELOPMENT

1. Soil fertility and statistics training with CIMMYT Wheat trainees at the B.S. level having diverse backgrounds in agricultural research. Teaching focused on

experimental design for 'On Farm Research' programs. Soil fertility and statistics taught in Spanish and English.

2. Barreto, H. J., and W. R. Raun. 1988. MST Data Assistant, Integrated Data Management System. Software program for data entry and transformations. Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT), Apdo. Postal 6-641. Mexico D.F. 06600
3. Soil-Plant Nutrient Cycling and Environmental Quality, Plant and Soil Sciences 5813, (3 hours), spring semester, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010. Subject matter includes the study of relationships between soil nutrient supply/plant response and associated theoretical applications, nutrient cycling for N, P, K and S, applied techniques for determining fertilizer response and yield goals, and dynamics of soil organic C. Supplemental text prepared for class use, and that is published on the web (<http://soil5813.okstate.edu>).
4. Seminar, Plant and Soil Sciences 5020, (1 hour). Taught in the spring 1994, fall 1994, spring 1995, fall 2005, spring 2005. Designed for formal presentation of M.S. and Ph.D. research topics in agronomic sciences.
5. Senior Seminar, Plant and Soil Sciences 4571, (1 hour), fall semester, 1994. Exiting course for seniors in agronomy that addresses current issues in soil and crop science. Formal reporting on specific topics is required. Strengths and weaknesses of their B.S. program is discussed.
6. Precision Agriculture, Plant and Soil Sciences 4213 (3 hours), spring semester, 1997, 1999, 2001, 2002, 2004, 2006, 2007, 2008, 2010, 2011. Taught over the web (<http://soil4213.okstate.edu>) with the Department of Biosystems and Agricultural Engineering. Address the use of indirect measures for nutrient analyses, applications of GPS and GIS, sensor-based technologies employing visible and non-visible portions of the spectra, use of geostatistics in determining field element size, methods of establishing critical nutrient levels, and resultant recommendations.
7. Soil Nutrient Management 4234 (4 hours), fall semester 2004, 2005, 2006, 2007, 2008, 2009. Taught over the web (<http://soil4234.okstate.edu>). Junior-Senior level class that includes nutrient deficiencies, and nutrient management for cereal crops, and turfgrass. Added topics include soil testing, Bray's mobility concept, micronutrients in agriculture, and comprehensive study of nitrogen cycling and interrelationships of crop management with the environment.
8. Research Methods 5111 (1 hour) spring semesters 2005, 2007, 2009, 2011. Taught over the web (http://www.nue.okstate.edu/Research_Methods/Research.html). Biometrical and statistics applications for M.S. and Ph.D. students in Biological Sciences.

GRADUATE STUDENT THESES: (Major Advisor)

1. Attefat, Mehdi. 1992. Leaching and Contamination of $\text{NO}_3\text{-N}$ in Agricultural and Nonagricultural Systems. M.S. Thesis.
2. Ascencio, Edgar Noel. 1992. Sequential measurements of soil ammonium-N and nitrate-N from two long-term wheat fertility experiments with variable N rates. M.S. Thesis.
3. Sembiring, Hasil. 1993. Effect of surface residue inversion on moisture conservation. M.S. Thesis.
4. Jojola, Michael E. 1994. Accuracy and precision of total nitrogen using automated dry combustion. M.S. Thesis.
5. Ascencio, Edgar Noel. 1995. Sequential measurements of soil $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ from two long-term fertility experiments with variable N rates, and distribution of soil profile $\text{NO}_3\text{-N}$ under flooded conditions using a bromide tracer. Ph.D. Dissertation.
6. Kanampiu, Fred, 1995. Effect of nitrogen rate on plant nitrogen loss in winter wheat varieties and glutamine synthetase activity. Ph.D. Dissertation.
7. Gavi-Reyes, Francisco. 1995. Effect of applied sewage sludge, ammonium nitrate and phosphorus on yield of winter wheat, soil profile inorganic nitrogen accumulation and cadmium uptake. Ph.D. Dissertation.
8. Ball, Jeff B. 1995. Effect of nitrogen rate, method of application and residue management on estimated N loss in winter wheat. M.S. Thesis.
9. Phillips, Steven B. 1995. Seasonal and long-term variability in well water nitrate-nitrogen. M.S. Thesis.
10. Taylor, Shannon L. 1996. Bermudagrass forage yield response to high rates of applied urea and ammonium nitrate and the use of spectral radiance for estimating nitrogen deficiencies and soil variability. M.S. Thesis
11. Chen, Jing. 1997. Winter wheat and cheat response to foliar fertilizer nitrogen application. M.S. Thesis.
12. Keahey, Dale, Alan. 1997. Improving fertilizer nitrogen use efficiency using alternative legume interseeding in continuous corn production systems. M.S. Thesis.
13. Lees, Heather, L. 1997. I. Development of field standards for variable rate technology and II. Estimating gaseous nitrogen losses from *Triticum aestivum* L. using ^{15}N . M.S. Thesis.
14. Sembiring, Hasil. 1997. Management of nitrogen and phosphorus experiments using spectral radiance and soil N mineralization in winter wheat and bermudagrass. Ph.D. dissertation.
15. Thomason, Wade E. 1998. I. Winter wheat fertilizer nitrogen use efficiency in grain and forage production systems and II. Detection of nitrogen deficiencies in cotton using spectral radiance measurements and cotton response to topdress applications. M.S. Thesis

16. Lukina, Erna V. 1998. Effect of row spacing, N rate and growth stage on spectral radiance in winter wheat. M.S. Thesis.
17. LaRuffa, Joanne M. 1999. Optimum field element size for maximum yields in winter wheat using variable nitrogen rates. M.S. Thesis.
18. Phillips, S.B. 1999. I. Alfalfa yield response to method and timing of applied phosphorus, II. Effect of dual applied phosphorus and gypsum on wheat forage and grain yield. Ph.D. Dissertation.
19. DeLeon, Micah. 1999. Determination of phosphorus nutritional status using spectral response. M.S. Thesis.
20. Dennis, Jeremy. 1999. Winter wheat and cheat response to late-season foliar nitrogen applications. M.S. Thesis.
21. Woolfolk, Curt W. 2000. Influence of late-season foliar nitrogen applications on grain protein in winter wheat. M.S. Thesis.
22. Cossey, Doug. 2000. Relationship between ammonium and nitrate in wheat plant tissue and estimated plant nitrogen loss. M.S. Thesis.
23. Mullen, R.W. 2001. Effect of foliar nitrogen on wheat quality and cheat reduction. M.S. Thesis.
24. Wynn, K. 2001. Effect of long-term application of biosolids and ammonium nitrate on winter wheat yield, nitrogen uptake, and heavy metal accumulation. M.S. Thesis.
25. Thomason, W.E. 2001. I. Production system techniques to increase nitrogen use efficiency in winter wheat, II. Switchgrass response to harvest frequency, and time, and rate of applied nitrogen. Ph.D. Dissertation.
26. Lukina, E.V. 2001. I. Evaluation of alternative methods for determining estimated yield. II. Use of In-Season Estimates of Yield for topdress applications of fertilizer nitrogen in winter wheat. Ph.D. Dissertation.
27. Freeman, Kyle W. 2002. Late-season prediction of wheat grain yield and grain protein. M.S. Thesis.
28. Teal, Roger T. 2002. Effect of tillage and anhydrous ammonia application on nitrogen use efficiency of hard red winter wheat. M.S. Thesis.
29. Moges, Shambel. 2002. Use of red and green NDVI for yield prediction in winter wheat. M.S. Thesis.
30. Mullen, Robert. 2002. I. Estimation of nitrogen mineralization in soils from long-term application of fertilizer and its effect on winter wheat response to topdress nitrogen, II.

Use of in-season sensor derived response indices to predict the response index at harvest. Ph.D. Dissertation.

31. Humphreys, Micah 2003. Indirect estimates of soil electrical conductivity for improved prediction of yield. M.S. Thesis.
32. Hodgen, Paul. 2003. I. Use of a response index and in-season predicted yield to determine topdress nitrogen needs, II. Relationship between the response index determined in-season and at harvest. M.S. Thesis.
33. Lawles, Jason. 2004. Peanut yield response to foliar applied phosphorus. M.S. Thesis.
34. Mosali, Jagadeesh. 2004. Effect of foliar application of phosphorus on winter wheat grain yield, and Use of in-season reflectance for predicting yield potential. Ph.D. Dissertation.
35. Girma, Kefyalew. 2004. I. Identification of optical spectral signatures for detecting cheat and ryegrass in winter wheat. II. Determination of optimum rate and growth stage for foliar applied phosphorus in corn. Ph.D. Dissertation.
36. Morris, Keri, 2004. Mid-season recovery to nitrogen stress in winter wheat. M.S. Thesis.
37. Arnall, Brian, 2004. Relationship between coefficient of variation measured by spectral reflectance and plant density at early growth stages. M.S. Thesis.
38. Teal, Roger, 2005. I. Influence of hybrid, population and nitrogen rate on plant spectral prediction of corn yield, II. Effect of tillage and anhydrous ammonia application on nitrogen use efficiency of hard red winter wheat. Ph.D. Dissertation.
39. Martin, Kent, 2005. Expression of spatial variability in corn (*Zea Mays* L.) as influenced by growth stage using optical sensor measurements. M.S. Thesis.
40. Freeman, Kyle, 2005. Influence of beds and row spacing in winter wheat, and by-plant prediction of corn forage yield. Ph.D. Dissertation.
41. Moges, Shambel. 2005. Yield potential estimation in grain sorghum (*Sorghum bicolor* L.), and effects of plant height, sensing angle and height on yield prediction of corn (*Zea mays* L.). Ph.D. Dissertation.
42. Mack, Clint. 2006. Validation of nitrogen calibration strip technology for prescribing accurate topdress nitrogen fertilizer. M.S. Thesis.
43. Lawles, Kyle. 2006. Effect of delayed emergence on corn grain yield. M.S. Thesis.
44. Walsh, Olga S. 2006. Effect of delayed nitrogen fertilization on corn grain yields. M.S. Thesis.
45. Tubana, Brenda. 2007. Adjusting mid-season nitrogen using a sensor-based optimization algorithm to increase use efficiency in corn. Ph.D. Dissertation.

46. Chung, Byungkyun. 2007. Evaluation of spatial resolutions for predicting corn grain yield. 2007. Ph.D. Dissertation.
47. Holtz, Starr. 2007. Total nitrogen uptake as a function of time in corn and winter wheat. M.S. Thesis.
48. Dotson, Clint, 2007. Effect of nitrogen fertilizer rate and placement on corn grain yield. M.S. Thesis.
49. Turner, Pamela. 2008. Indirect measurement of crop plant height using sonar. M.S. Thesis.
50. Edmonds, Daniel. 2008. Maize grain yield response to variable row nitrogen fertilization. M.S. Thesis.
51. Arnall, Brian. 2008. I. Development of a yield prediction model for mid-season nitrogen recommendations of cotton (*Gossypium hirsutum* L.), II. Use of by-plot CV's for refining mid-season fertilizer nitrogen rates. Ph.D Dissertation.
52. Daft, Cody. 2008. By-plant nitrogen response as function of delayed emergence in corn (*Zea mays* L.). M.S. Thesis.
53. England, Brandon, 2008. Stream and flat fan topdress application of urea ammonium nitrate in winter wheat (*Triticum aestivum* L.). M.S. Thesis.
54. Desta, Birehane, 2009. Identification of spectral bands for detecting nitrogen and phosphorus deficiencies in winter wheat M.S. Thesis.
55. Walsh, Olga, 2009. I. Real-time use of soil moisture data for refined Greenseeker sensor based nitrogen recommendations in winter wheat. II. Effect of foliar P fertilization on corn grain yield and phosphorus use efficiency. Ph.D. Dissertation.
56. Kanke, Yumiko, 2009. Red-edge as a potential index for detecting differences in plant nitrogen status in winter wheat. M.S. Thesis.
57. Vossenkemper, Jake. 2009. Maize (*Zea mays* L.) Grain Yield Response to Nitrogen Applied at Different Distances Away from the Row. M.S. Thesis.
58. Torres, Guilherme. 2010. Effect of Foliar Phosphorus and Surfactants on Winter Wheat (*Triticum aestivum* L.) Grain yield. M.S. Thesis.
59. Waldschmidt, Kevin. 2011. Effect of Plant Population and Nitrogen Rate on Spectral Properties and Grain Yield of Winter wheat. M.S. Thesis.
60. Kelly, Jonathan. 2011. By Plant Prediction of Corn (*Zea mays* L.) Grain Yield Using Height and Stalk Diameter. M.S. Thesis.

MAJOR ADVISOR, GRADUATE DEGREE PROGRAMS, 1991-present

<u>Name</u>	<u>Country</u>	<u>Degree</u>	<u>Completion Date</u>
1. Attefat, Mehdi	Iraq	M.S	1992
2. Ascencio, Edgar Noel.	El Salvador	M.S.	1992
3. Sembiring, Hasil.	Indonesia	M.S.	1993
4. Jojola, Michael E.	USA	M.S.	1994
5. Ascencio, Edgar Noel.	El Salvador	Ph.D.	1995
6. Kanampiu, Fred	Kenya	Ph.D.	1995
7. Gavi-Reyes, Francisco	Mexico	Ph.D.	1995
8. Ball, Jeff B.	USA	M.S.	1995
9. Phillips, Steven B.	USA	M.S.	1995
10. Taylor, Shannon L.	USA	M.S.	1996 **
11. Chen, Jing	China	M.S.	1997
12. Keahey, Dale, Alan.	USA	M.S.	1997
13. Lees, Heather, L.	USA	M.S.	1997 **
14. Sembiring, Hasil	Indonesia	Ph.D.	1997 ***
15. Thomason, Wade	USA	M.S.	1998
16. Lukina, Erna V.	Uzbekistan	M.S.	1998
17. LaRuffa, Joanne M.	USA	M.S.	1999 **
18. Phillips, Steven B.	USA	Ph.D.	1999 ***
19. Dennis, Jeremy	USA	M.S.	1999
20. DeLeon, Micah	Argentina	M.S.	1999
21. Cossey, Doug	USA	M.S.	1999
22. Woolfolk, Curt	USA	M.S.	1999
23. Mullen, R.W.	USA	M.S.	2001 **
24. Lukina, Erna, V.	Uzbekistan	Ph.D.	2001 ***
25. Thomason, Wade	USA	Ph.D.	2001 ***
26. Wynn, Kathie J.	USA	M.S.	2001
27. Freeman, Kyle W.	USA	M.S.	2002 **
28. Teal, Roger	USA	M.S.	2002
29. Moges, Shambel	Ethiopia	M.S.	2002
30. Mullen, R.W.	USA	Ph.D.	2003 *** †
31. Humphreys, M.	USA	M.S.	2003
32. Hodgen, Paul	USA	M.S.	2003
33. Lawles, Jason	USA	M.S.	2004
34. Mosali, Jagadeesh	India	Ph.D.	2004
35. Brixey, Keri	USA	M.S.	2004
36. Arnall, Brian	USA	M.S.	2004
37. Girma, Kefyalew	Ethiopia	Ph.D.	2004 ***
38. Martin, Kent	USA	M.S.	2005 **
39. Freeman, Kyle W.	USA	Ph.D.	2005 ***
40. Teal, Roger	USA	Ph.D.	2005 β
41. Moges, Shambel	Ethiopia	Ph.D.	2005
42. Mack, Clinton	USA	M.S.	2007
43. Lawles, Kyle	USA	M.S.	2007
44. Byungkyun, Chung	Korea	Ph.D.	2007
45. Tubana, Brenda	Philippines	Ph.D.	2007 β ***
46. Holtz, Starr	USA	M.S.	2007 **

47. Walsh, Olga	Russia	M.S.	2007
48. Dotson, Clint	USA	M.S.	2007
49. Arnall, Brian	USA	Ph.D.	2008 ***
50. Turner, Pam	USA	M.S.	2008
51. Edmonds, Daniel	USA	M.S.	2008 **£
52. England, Brandon	USA	M.S.	2008
53. Daft, Cody	USA	M.S.	2008
54. Walsh, Olga	Russia	Ph.D.	2009 ***
55. Desta, Birehane	Ethiopia	M.S.	2009
56. Kanke, Yumiko	Japan	M.S.	2009 Σ € **
57. Vossenkemper, Jacob	USA	M.S.	2010
58. Torres, Guilherme	Brazil	M.S.	2010 **
59. Rutto, Emily	Kenya	Ph.D.	2011 ‡ ***€
60. Torres, Guilherme	Brazil	Ph.D.	2013 ‡ ***
61. Kelly, Jonathan	USA	M.S.	2011 ‡
62. Waldschmidt, Kevin	USA	M.S.	2011 ‡
63. Mullock, Jeremiah	USA	M.S.	2011 ‡
64. Khim, Bee	Malaysia	M.S.	2011 ‡
65. Crain, Jared	USA	M.S.	2012 ‡
66. Macnack, Natasha	Suriname	M.S.	2012 ‡

** Outstanding M.S. student, Department of Plant and Soil Sciences

*** Outstanding Ph.D. student, Department of Plant and Soil Sciences

£ Phoenix award winner, Outstanding M.S. Student, Oklahoma State University

β Williams Outstanding Ph.D Thesis Award Recipient

Σ Williams Distinguished Fellowship Recipient

€ Graduate College Research Fellowship Recipient

‡ Current graduate student

† 2004 Emil Truog, SSSA Recipient (outstanding SOILS Ph.D student international, SSSA) Research Thesis (M.S.) and/or Dissertation (Ph.D) required for all degrees.

Since 1992, 60% of the students receiving the outstanding M.S. and/or Ph.D student award in the Department of Plant and Soil Sciences have come from the soil fertility project.

PROFESSIONAL INVITATIONS

1. NeATA Conference, Grand Island, NE, February 9-10, 2011.
2. 10th Annual International Precision Agriculture Conference, Denver, CO, July 18-21, 2010. Keynote Speaker, Opening Plenary Session.
3. ASA-SSSA-CSSA meetings, Pittsburgh, PA, Nov 4, 2009. Invited speaker, "Strategies for improving nutrient use efficiency in corn and small grains."
4. ASA-SSSA-CSSA meetings, New Orleans, LA, Nov 3, 2007. Invited speaker, "Nitrogen Management for Wheat and Corn, What you Shouldn't Do."
5. ASA-SSSA-CSSA meetings, Indianapolis, IN, Nov 4, 2006. Invited speaker,
6. ASA-SSSA-CSSA meetings, Salt Lake City, UT, Nov 6-10, 2005. Invited speaker "What New Equipment Is Available to Improve N-Use Efficiency?"
7. 7th International Wheat Conference, Mar de Plata, Argentina, November 27-December 2, 2005. K.W. Freeman and W.R. Raun. Advances in nitrogen handling strategies to increase the productivity of wheat

8. AAPRESID Rosario, Argentina, August 10-13, 2004. Invited speaker "Aumentando la eficiencia del uso de nitrogeno en cereales.
9. ASA-SSSA-CSSA meetings, Denver, CO, Nov 2-6, 2003. Invited symposium speaker "Variable Nitrogen Management of Field Crops.'
10. Great Plains Soil Fertility Workshop, Denver, CO, March 7-8, 2000. Invited symposium speaker 'In-season fertilizer nitrogen application based on predicted yield potential.'
11. ASA-SSSA-CSSA meetings, Salt Lake City, Utah, October 31-November 4, 1999. Invited symposium speaker 'Implementing Diagnostic Tools for Nitrogen.
12. Intensive Wheat Management Conference, March 4-5, 1998, Denver, Colorado. Invited symposium speaker, 'Sensor based nutrient management.'
13. 5th International Symposium on Soil & Plant Analysis, August 2-7, 1997, Bloomington, Minnesota. Invited symposium speaker, Testing for the future: New Technologies.
14. The American Society for Horticultural Science (ASHS), July 23-26, 1997, Salt Lake City, Utah. Invited symposium speaker, 'Soil-plant inorganic N buffering and indirect measures of nutrient analyses.'
15. CIMMYT, Ciudad Obregon, Mexico, February 9-12, 1997. Cooperation with Dr. Ken Sayre on methods to improve N-use efficiency in wheat using estimated plant N loss and spectral radiance measurements.
16. KSU/Farmland Industries Crop Production Update, Manhattan, Kansas. Invited speaker in 1994, 1995 and 1996 to discuss 'Soil-plant inorganic N buffering,' 'Use of foliar fertilizers for cheat control in winter wheat,' and 'Applications of sensor-based technologies for detecting nutrient deficiencies.'
17. ASA-SSSA-CSSA meetings, Indianapolis, IN, November 1996. Invited symposium speaker 'Enhancing soil testing and recommendations to meet the future.'
18. Great Plains Soil Fertility Workshop, Denver, CO, March, 1996. Invited symposium speaker 'Use of spectral radiance for detecting in-season N deficiencies in winter wheat.'
19. ASA-SSSA-CSSA meetings, Cincinnati, OH, November, 1993. Invited symposium speaker, 'Methods of improving research plot uniformity in long-term experiments.'
20. Andean Region Agriculture, Caracas, Venezuela, December, 1990. Invited symposium speaker, 'Improved methods of phosphorus placement in volcanic ash soils.'
21. PCCMCA, San Salvador, El Salvador, March, 1990. Invited symposium speaker, 'Applications of experimental designs in field experiments.'
22. CIAT, Cali, Colombia, January, 1989. Invited to participate in the strategic planning of 'Agronomic Research in the IARC's.
23. PCCMCA, San Pedro Sula, Honduras, March, 1989. Invited symposium speaker, 'Legume Interseeding in Maize production
24. PCCMCA, San Jose, Costa Rica, March 1988. Invited symposium speaker, 'Use of zero-tillage in the tropics and adverse impacts of burning.'

CIMMYT RESEARCH PAPERS

1. Raun, W. R., and K. D. Sayre. 1986. Use of line-source experiments for wheat genotype screening and yield stability analysis. CIMMYT Wheat Program, Mexico D.F.

2. Raun, W. R., and K. D. Sayre. 1986. Interplot competition; bias in observed grain yield as affected by different neighboring wheat and triticale genotypes. CIMMYT Wheat Program, Mexico D.F.
3. Sayre, K. D., and W. R. Raun. 1986. Evaluation of irrigation timing, and nitrogen rate on the effects of yellow berry in 38 different durum wheat genotypes. CIMMYT Wheat Program, Mexico D.F.
4. Sayre, K. D., and W. R. Raun. 1986. Yield trial of selected bread wheat, durum wheat, triticale and barley genotypes under salt stress. CIMMYT Wheat Program, Mexico D.F.
5. Sayre, K. D., and W. R. Raun. 1986. Durum wheat salt tolerance, Guaymas, Mexico. CIMMYT Wheat Program, Mexico. D.F.
6. Wall, P. C., P. Hobbs, D. A. Saunders, M. A. McMahon, W. R. Raun and R. L. Westerman. 1986. Integrated cultural and chemical control of Avena fatua and Phalaris minor in spring wheat. CIMMYT Wheat Program, Mexico. D.F.
7. Proyectos Colaborativos en Agronomía, Desarrollo y Mejoramiento de Germoplasma en Maíz. 1989. CIMMYT, Guatemala City, Guatemala.
8. Análisis de los Ensayos Regionales de Agronomía. 1990. Programa Regional de Maíz Para Centro América, Panamá y El Caribe. CIMMYT, Guatemala City, Guatemala.
9. Análisis de los Ensayos Regionales de Agronomía. 1991. Programa Regional de Maíz Para Centro América, Panamá y El Caribe. CIMMYT, Guatemala City, Guatemala.

POPULAR PRESS and DEPARTMENTAL PUBLICATIONS

1. Boman, R.K., J.J. Sloan, R.L. Westerman, W.R. Raun and G.V. Johnson. 1992. Using phosphorus fertilizers to maintain wheat forage and grain yields on acid soils. Better Crops. 76:(4) 16-19.
2. Raun, W.R. and E.N. Ascencio. 1992. Azufre: Estas considerando este elemento en su regimen de fertilización?. (technical brochure in Spanish for the Sulphur Institute, Washington D.C.)
3. Westerman, R.L. 1992. Soil Fertility Research Highlights, Efficient Use of Fertilizers. Okla. Agric. Exp. Sta., Agronomy 92-1. 223 pages.
4. Horn, G.W., W.R. Raun, G.A. Highfill, C. Bown and R.K. Boman. 1993. Evaluation of bloat potential of cattle as affected by N and K fertilization in continuous winter wheat. Animal Science Research Report, Oklahoma State University.

5. Johnson, G.V. (ed). 1993. Oklahoma soil fertility handbook. Prepared 2½ chapters included in this 8 chapter volume. Also assisted in compiling and editing the handbook.
6. Raun, W.R., R.K. Boman, S.L. Taylor, R.L. Westerman, G.V. Johnson and E.A. Guertal. 1993. Soil Fertility Research Highlights. Okla. Agric. Exp. Sta., Agronomy 93-1. 266 pages.
7. Johnson, G.V., and W.R. Raun. 1994. Oklahoma soil fertility research, applications for nutrient management and the environment, 1989-1993. Okla. Agric. Exp. Sta., Agronomy 94-2. 50 pages.
8. Boman, R.K., S.L. Taylor, W.R. Raun, G.V. Johnson, D.J. Bernardo and L.L. Singleton. 1996. The Magruder plots, a century of wheat research in Oklahoma. Okla. Agric. Exp. Sta., Agronomy 96-1. 69 pages.
9. Raun, W.R., J.B. Solie, G.V. Johnson, M.L. Stone, R.W. Whitney, H.L. Lees, H. Sembiring and S.L. Taylor. 1997. Small scale variation in soil test phosphorus and bermudagrass yield. Better Crops. 81:(1) 14-16.
10. Stone, M.L., W.R. Raun, G.V. Johnson, J.B. Solie, R.W. Whitney, H. Sembiring, J.M. LaRuffa and E.V. Lukina. 1997. Sensing nitrogen deficiencies in winter wheat and bermudagrass. Better Crops. 81:(4) 15-16.
11. Sembiring, H., J.M. LaRuffa, S.B. Phillips, E.V. Lukina, W.E. Thomason, J. Chen, H.L. Lees, D.A. Keahey, J.L. Dennis, D.A. Cossey, M.W. Goedeken, S.L. Norton, B.M. Howell, M.J. DeLeon, S.L. Taylor, J.B. Solie, M.L. Stone, R.W. Whitney, N.T. Basta, J.A. Hattey, H. Zhang, R.L. Westerman, G.V. Johnson and W.R. Raun. 1997. Soil Fertility Research Highlights. Okla. Agric. Exp. Sta., 364 pages.
12. Goedeken, Mick, Gordon Johnson and Bill Raun. 1998. Expectations of precision phosphate management. Better Crops. 82:(1) 28-31.
13. Zhang, Hailin, Gordon Johnson, Bill Raun, Nick Basta and Jeff Hattey. 1998. OSU Soil Test Interpretations. F-2225. Okla. Coop. Ext. Serv. Okla. State Univ. Stillwater, OK.
14. Basta, N.T., W.R. Raun and F. Gavi. 1998. Wheat grain cadmium under long-term fertilization and continuous winter wheat production. Better Crops. 82:(2) 14-15.
15. Raun, W.R., G.V. Johnson, M.L. Stone, J.B. Solie, W.E. Thomason, and E.V. Lukina. 1999. In-season prediction of yield potential in winter wheat. Better Crops. 83:(2) 24-25.
16. LaRuffa, J.M., G.V. Johnson, S.B. Phillips and W.R. Raun. 1999. Sulfur and chloride response in Oklahoma winter wheat. Better Crops: 83(4):28-30.

17. Mullen, R.W., G.V. Johnson, J.F. Stritzke, J.L. Caddel, S.B. Phillips and W.R. Raun. 2000. Alfalfa yield response to method and rate of applied phosphorus. *Better Crops*: 84(3):18-23.
18. Lukina, E.V., K.W. Freeman, R.W. Mullen, K.J. Wynn, W.E. Thomason, Roger Teal, Jagadeesh Mosali, Tao Feng, D.E. Needham, C.N. Washmon, J.B. Solie, M.L. Stone, N.T. Basta, J.A. Hattey, H. Zhang, S. Deng, J.M. Shaver, R.L. Westerman, G.V. Johnson and W.R. Raun. 2000. Soil Fertility Research Highlights. *Okla. Agric. Exp. Sta.*, 342 pages.
19. Mullen, R.W., G.V. Johnson, J.F. Stritzke, J.L. Caddel, S.B. Phillips and W.R. Raun. 2001. Alfalfa responds to high P rates, P banding. *Fluid Journal*. Winter, 9-11.
20. Mullen, R.W., K.W. Freeman, G.V. Johnson, and W.R. Raun. 2001. The Magruder plots, long-term wheat fertility research. *Better Crops*: 85(4):6-8.
21. Mullen, R.W., W.R. Raun, and G.V. Johnson. 2003. Sensor-based N management strategy. *Fluid Journal* 11(3):12-13.
22. Johnson, Gordon, and Bill Raun. 2003. Sensor-based N management. In *Southern Plant Nutrition Management Conference*, Rasnake, M. (ed.). Olive Branch, Mississippi, Oct 7-8. Samuel Roberts Noble Foundation.
23. Raun, W.R., G.V. Johnson, J.B. Solie, M.L. Stone, K.L. Martin, and K.W. Freeman. 2004. In-Season Fertilizer N Rates using Predicted Yield Potential and the Response Index. *Better Crops* 88(2): 8-11.
24. Zhang, H., and W.R. Raun. 2004. Chloride and Sulfate Status in Oklahoma Soils. *Southern Plant Nutrition Management Conference Proceedings*. October 5-6. Olive Branch, MS.
25. Melchiori, Ricardo, Octavio Caviglia, Augustin Bianchini, Nelson Faccendini, y William Raun. 2005. Utilizacion de sensores remotos para fertilizacion nitrogenada en maiz. *Simposio de Fertilidad en Rosario, PPI, Rosario, Argentina*.
26. Raun, W.R., G. Johnson, S. Phillips, W. Thomason, J. Dennos, and D. Cossey. 2006. Late-season applied N can increase alfalfa yields. *Fluid Journal*. 14 (2): 20-23.
27. Girma, K., B. Raun, H. Zhang, and J. Mosali. 2006. What about foliar P on corn and winter wheat? *Fluid Journal*. 14(3):17-19.
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TECHNICAL EXPERIENCE

User experience with more than 30 different software packages for data management, data analysis, desktop publishing and graphics. Thirty years of operational experience with SAS (Statistical Analysis System).

Operational experience with various colorimeters, x-ray diffraction and atomic absorption spectrophotometers, dry combustion for total N and organic C in soil and plant tissue, automated flow injection analyses systems for determination of NH₄-N, and NO₃-N, inductive coupled plasma spectrometers and stable isotope ratio mass spectrometry.

PUBLIC AND SOCIAL SERVICE

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207. Taylor, R.K., D.B. Arnall, Ahmad Khalilian, W.R. Raun, J.B. Solie, and John Wilkerson. 2008. Current and Future Status of Sensor Technology for Nitrogen Management in Cotton. Agronomy Abstracts. ASA, Madison, WI.
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209. Melchiori, R., S. Albarenque, A. Bianchini, and W.R. Raun. 2008. Sensor Based Nitrogen Rate Calculator Validation for Wheat in Argentina. Agronomy Abstracts. ASA, Madison, WI.
210. Meisinger, J., J. Schepers, and W.R. Raun. 2008. Crop Nitrogen Requirement and Fertilization. Agronomy Abstracts. ASA, Madison, WI.
211. Girma, K., M.C. Daft, D. Edmonds, D. Arnall, H. Zhang, and W.R. Raun. 2008. Status of Soil Nitrate and pH after Continuous Application of Biosolids. Agronomy Abstracts. ASA, Madison, WI.
212. Gutierrez, M., A. Klatt, M. Reynolds, W. R. Raun, and M. Stone. 2008. Association Between Water Reflectance Index and Yield in Bread Wheat Under Stressed Field Growing Conditions. Agronomy Abstracts. ASA, Madison, WI.
213. Kanke, Yumiko, B. Arnall, D. Edmonds, B. England, B. Desta, and W.R. Raun. 2008. A Visual Method of Calibrating Nitrogen Need, Tied to Season NDVI Values. Agronomy Abstracts. ASA, Madison, WI.
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215. Raun, W.R., D. Edmonds, J. Solie, J. Schepers, R. Mullen, D. Arnall, and R. Taylor. 2009. Strategies for Improving Nutrient Use Efficiency in Corn and Small Grains. Agronomy Abstracts, ASA Madison, WI.
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217. Zhang, H., D. Nofziger, and W. Raun. 2009. Fertilizing Based On Soil Testing and Sensor Technology. Agronomy Abstracts, ASA Madison, WI.
218. Torres, G., J. Vossenkemper, Y. Kanke, D. Edmonds, and W. Raun. 2009. Evaluation of Triple Super Phosphate as Foliar Fertilizer. Agronomy Abstracts, ASA Madison, WI.
219. Vossenkemper, J., Y. Kanke, D. Edmonds, R. Taylor, J. Solie, and W. Raun. 2009. Grain Yield Response to Nitrogen Applied at Different Distances Away From the Row. Agronomy Abstracts, ASA Madison, WI.

220. Kelly, J., D. Edmonds, J. Crain, Y. Kanke, R. Taylor, J. Solie, and W. Raun. 2009. Refining Yield Potential Algorithms in Maize (Zea mays L.) Based On Plant Height, Competition, NDVI, and Stalk Diameter. Agronomy Abstracts, ASA Madison, WI.
221. Edmonds, D., J. Kelly, J. Crain, Y. Kanke, R. Taylor, J. Solie and W. Raun. 2009. Maize (Zea mays L.) Grain Yield Response to by-Plant Nitrogen Fertilization. Agronomy Abstracts, ASA Madison, WI.
222. Arnall, D. C. Godsey, D. Bellmer, R. Huhnke, and W. Raun. 2009. The Nitrogen Requirement and Use Efficiency of Sweet Sorghum Produced in Central Oklahoma. Agronomy Abstracts, ASA Madison, WI.
223. Rutto, Emily, Brian Arnall, Daniel Edmonds, Yumiko Kanke, Birehane Desta, Jerry May, and Bill Raun. 2009. Cotton recovery to early season nitrogen stress. Agronomy Abstracts, ASA Madison.
224. Kanke, Yumiko, Birehane Desta, Daniel Edmonds, John Solie, Marvin Stone and Bill Raun. 2009. A Visual Method for Calibrating Nitrogen Need, Tied to Seasonal NDVI Values in Corn. Agronomy Abstracts, ASA Madison.
225. Kanke, Yumiko, Bill Raun, Birehane Desta, Marvin Stone, and John Solie. 2009. Red edge as a new index for determining optimum mid-season N rate fertilization in winter wheat. Agronomy Abstracts, ASA Madison.
226. Zhang, H., David Nofziger, Bill Raun, and Brian Arnall. 2009. Fertilizing based on soil testing and sensor technology. Agronomy Abstracts, ASA Madison.
227. Torres, Guilherme, and William Raun. 2010. Corn (Zea mays L.) seed orientation at planting can influence emerging leaf angle. Agronomy Abstracts, ASA Madison.

FUNDS RAISED SPECIFICALLY FOR INTERNATIONAL EXPERIENCE FOR OSU GRADUATE STUDENTS AND FACULTY

Graduate Students who have been and short (1 to 2 week) and long-term (4-month) study at the International Maize and Wheat Improvement Center (CIMMYT), and other regions in the world, 1995-present.

Date	Location	Personnel	Purpose
Jan-95	Ciudad Obregon, MX	Bill Raun	Initial discussions for collaborative sensor work
Feb-97	Ciudad Obregon, MX	Bill Raun	Long-term student involvement
Jan-99	Ciudad Obregon and Texcoco, MX	Steve Phillips, Joanne LaRuffa, Wade Thomason, Sherry Britton, Joe Vadder, Gordon Johnson, John Solie, Dick Whitney	IRSP 98, 2-wheel tractor, refine INSEY, wheat bed planter
Sep-99	Texcoco, MX	Erna Lukina	IRSP 98, use of EY
Aug-00	Texcoco, MX	Marvin Stone, Kyle Freeman, Robert Mullen, Roger Teal, Dwayne Needham, Kathy Wynn, Carly Washmon	IRSP 99, refine INSEY, sensor design for plant breeding
Jan-Apr-01	Ciudad Obregon, MX	Kyle Freeman	4-month OSU representation, NRI grant 200-03530
Apr-01	Ciudad Obregon, MX	Kyle Freeman	Wheat Harvest
Jul-01	El Batan, MX	Jagadeesh Mosali, Shambel Moges, Micah Humphreys, Paul Hodgen, Carly Washmon	IFAFS Grant
Jan-Apr-02	Ciudad Obregon, MX	Paul Hodgen	4-month OSU representation for IFAFS Grant

Jun-02	El Batan, Tlaltizapan, MX	Robert Mullen, Kyle Freeman	Deliver hand-held sensor, initiate corn sensing program
Aug-02	Texcoco, MX	Bill Raun	Work for 5-months on the development of a corn algorithm for N
Nov-02	El Batan, MX	Keri Brixey, Jason Lawles, Kyle Freeman	Corn harvest, sensed earlier in June by Kyle Freeman and Robert Mullen, delivery of 3 new Greenseeker sensors.
Jan-04	Ciudad Obregon, MX	Kyle Freeman, Brian Arnall, and Kody Featherston	Collect by-plot CV data for improved prediction of yield potential
July-04	New Delhi, India	Kent Martin	Train CIMMYT Rice-Wheat Consortium staff in the use of hand-held sensors for improved N fertilization
July 04	Beijing, China	Kyle Freeman	Training of Chinese National Academy of Sciences Personnel in the use of hand- held sensors
July 05	New Delhi, India	Kent Martin, Brian Arnall	Workshop for CIMMYT and National Program scientists
July 05	Esperance, Australia	Kyle Freeman	Work with David and Sally Cox on the extension of Sensor Based N Rate Technologies for Wheat in South West Australia
Sep 05	El Batan, MX	Olga Walsh, Brenda Tubana, Starr Holtz, Chung Byungkyun, Clint Mack, Kyle Lawles, D. Zavodny	Sensor Based N Workshop for CIMMYT and National Program Staff
Oct 05	Ankara, Turkey	Kyle Freeman, Roger Teal	Sensor Based N Workshop for CIMMYT and National Program Staff
Sep 05	Beijing, China	Brian Arnall, Carol Jones, Hailin Zhang	Sensor Based N Workshop for CIMMYT and National Program Staff
Nov 05	Mar de Plata, Argentina	Kyle Freeman	Invited Presentation, 7th International Wheat Conference
Jan 06	El Batan, MX	Brian Arnall, Joe Biggerstaff	Workshop with PATRONATO Farmers and Ivan Ortiz- Monasterio
Mar 06	Ciudad Obregon, Mexico	Kefyalew Girma	Yield Potential Symposium
Jul 06	New Delhi, India	Kent Martin	Follow up work with CIMMYT and NARS on Greenseeker Technology

Aug 06	Beijing, China, and Urgench, Uzbekistan	Brian Arnall, Starr Holtz	Sensor Based Nitrogen Workshop using Greenseeker
Aug 06	Adelaide, Australia	Brenda Tubana	Sensor Based Nitrogen Workshop using Greenseeker Technology
Jan 07	Ciudad Obregon, MX	Brenda Tubana, Starr Holtz, Pam Turner, Clint Dotson, Luke Hanks	SBNRC workshop with Ivan-Ortiz Monasterio, CIMMYT and the Patronato
Apr 07	Ciudad Obregon, MX	John Solie, Bill Raun	Dr. Norman Borlaug endorses GreenSeeker N management approach for Mexico
Jan 08	Harare, Zimbabwe	Daniel Edmonds, Cody Daft	GreenSeeker Sensor N workshop with CIMMYT
Feb 08	Tashkent, Uzbekistan	Daniel Edmonds	ICARDA, CIMMYT Sensor N workshop
Feb 08	Ciudad Obregon, MX	Brian Arnall, Randy Taylor	Installation of a GreenSeeker RT200 system for spring wheat
Mar 08	Samara, Russia	Daniel Edmonds	GreenSeeker Sensor Training
Nov 08	Harare, Zimbabwe	Daniel Edmonds, Cody Daft	GreenSeeker Training and Extension
Jan 09	Ciudad Obregon	Yumiko Kanke, Daniel Edmonds, Jared Crain	Side-view sensor readings
Feb 09	Nairobi, Kenya	Jake Vossenkemper, Jerry May, Yumiko Kanke	GreenSeeker Training and Extension
Jan 10	Ciudad Obregon, MX	Jonathan Kelly, Guilherme Torres	Collaborative work with Ivan Ortiz-Monasterio on spectral readings in wheat and corn
Jan 11	Ciudad Obregon, MX	Bee Khim, Jeremiah Mullock, Kevin Waldschmidt, Katy Butchee, Dillon Butchee	Collaborative work with Ivan Ortiz-Monasterio on spectral readings in wheat and corn
Total	37	88	

November 21-December 6, 1998: OSU-Team member, Sanliurfa, Turkey. Su-Yapi, GAP, World Bank irrigation development project. Assessment of crop production practices combined with established irrigation, resulting in a crop system recommendation.

Extension 2008

January 17, 2008. Stillwater, OK. "Myths and Facts associated with Nitrogen Use Efficiency." In Service Training, Stillwater Fair Grounds.

January 25, 2008. Salina, KS. "By-Plant N Management Strategies." Presented to the KARI.

March 4, 2008. Norman, OK. Use of soil moisture for improved yield prediction, presented to the Oklahoma Mesonet Group.

April 24, 2008. Stillwater, OK. Presentation to Calvin Burgess and Dominion Farms on the use of sensor based N technologies for Kenya.

May 14-15, 2008. Vernon TX, Agri-Pro Field Day, "Nitrogen rich strips for improved N management in Cereals.

May 16, 2008. Lahoma, OK, "Improving your bottom line in wheat N management", Lahoma Field Tour.

June 26, 2008. Guest lecture on Precision Agriculture in Oklahoma to Chapingo undergraduates visiting Dr. David Henneberry. Approximately 110 in attendance.

July 22, 2008. No-till Rotation Crops and Fertilizer Informational Workshop, Weatherford, OK. GreenSeeker program and the benefits that can be gained.

July 30-Aug 2, 2008. NUE Conference, Manhattan, KS. 75 Attendees for a meeting addressing university and industry needs in precision agriculture to improve N rate recommendations.

August 19, 2008. Estes Chemical Training Session, Stillwater, OK. Comprehensive GreenSeeker sensor training for 9 Estes Chemical employees.

September 11, 2008. Guest Lecture, AGED 4713, International Agriculture and Poverty in Today's World. 40 in attendance

October 14, 2008. Departmental Seminar, "Cereal Nitrogen Use Efficiency in Sub Saharan Africa. 25 in attendance.

October 21-25, 2008. Taught all lectures for SOIL 2224 due to Dr. Hattey's trip to Kenya.

November 5-6, 2008. Exhibitor and OSU representative, OARA meetings, Oklahoma City, OK.

Extension 2009

Made all contacts with Hans Braun (Director of the Wheat Program, CIMMYT) and Mahmood Ozmanzai (CIMMYT wheat breeder located in Afghanistan). They will now be working with the Oklahoma National Guard on a seed dissemination project partially funded by USAID.

August 16, 2009. Adoption of new technologies in the 3rd World. Presented to the Oklahoma Army National Guard, Deployment to Afghanistan.

August 26, 2009. PaSS update for area agronomists.

OARA Meetings, November 6, 2009, Oklahoma City, OK. GreenSeeker Sensor update presentation. Also, OSU Exhibitor.

December 5, 2009. Soil [fertility and N Rich Strips for Wheat](#). Aired on SUNUP

December 16, 2009. S, Micronutrients and K, presented at the OSU 2009 Crops School, Stillwater, OK.

Extension 2010

June 21, 2010. Sensor Based Technology Developed at OSU, ASFFPCO Conference, Oklahoma City, OK (downtown Sheraton)

June 25, 2010. Precision Agriculture at OSU, Chapingo Student Program, Mexico, Stillwater, OK.

Raun, Bill, John Solie, Jerry May, Hailin Zhang, Jonathan Kelly, Randy Taylor, Brian Arnall, and Ivan Ortiz-Monasterio. 2010. Nitrogen Rich Strips for wheat, corn, and other crops. E-1022. Oklahoma State University, Stillwater, OK.

Raun, Bill. Improved Sensor Based Nitrogen Management. November 4, 2010. OARA Annual Meetings, Oklahoma City, OK.

Raun, Bill, December 15, 2010. Optimizing winter wheat grain protein. OSU Winter Crops School.

Extension 2011

February 9, 2011. OSU N Rate Algorithm. Presented at the NeATA conference, Grand Island, NE.

February 10, 2011. Making a case for by-plant N management. Presented at the NeATA conference, Grand Island, NE.

2010 Safety Training

2nd quarter, May 6, 2010, Tornado Safety Tips

2nd quarter, July 1, 2010, Tornado Safety Tips

3rd quarter, August 12, 2010, Safety Training Module

4th quarter, October 11, 2010, Safety Training Module (suspicious package)

2011 Safety Training

1st quarter, February 4, 2011, Crime Prevention

INTERNATIONAL and OSU AWARD NOMINATIONS

Candidate	Award	Year(s) nominated	Received
Gordon V. Johnson	Fellow, SSSA	1995	1995
Gordon V. Johnson	Werner L. Nelson, ASA	1997, 1998	1998
Gordon V. Johnson	Soil Science, App. Res SSSA	2001, 2002, 2003	
James R. Brown	Fellow, SSSA	1998	1998
Nicholas T. Basta	James Whatley Award, OSU	1997, 1998	1998
Nicholas T. Basta	Environmental Quality-ASA	2000- 2007	

Nicholas T. Basta	Fellow, ASA	2002, 2003	2003
Nicholas T. Basta	Fellow, SSSA	2002, 2003, 2004	2004
R. L. Westerman	Soil Science, App. Res SSSA	1997, 1998, 1999, 2000	
Jefforey Jacobsen	Fellow, ASA	1998, 1999, 2000	2000
Jefforey Jacobsen	Fellow, SSSA	2001, 2002, 2004, 2005	2005
Charles Taliaferro	Fellow, ASA	1999	1999
Charles Taliaferro	Fellow, CSSA	1999, 2000	2000
John Caddel	Fellow, ASA	1999, 2000, 2001, 2002	
John Caddel	Fellow, CSSA	1999, 2000	
Jeffory A. Hattey	Merrick Foundation Teaching	1997, 1998	
Jeffory A. Hattey	AMOCO Teaching Award	1998	
Jeffory A. Hattey	GSD Award, OSU	1999	1999
Jeffory A. Hattey	NACTA Teacher Fellow Award	2000	2000
Jeffory A. Hattey	SSSA Soil Science Education	2007, 2008, 2009, 2010	2010
Arthur Klatt	International Service ASA	1999-2007	
Steven B. Phillips	Emil Truog Award, SSSA	2000	
Eugene Krenzer	Agronomic Extension ASA	2000, 2001	
Ken Sayre	Fellow, ASA	2001, 2002	
Gyles Randall	Werner L. Nelson, ASA	2001, 2002	2002
Sam Fuhlendorf	James Whatley Award, OSU	2000, 2001	2001
Shiping Deng	James Whatley Award, OSU	2001, 2002, 2003, 2004	2004
Hailin Zhang	Agronomic Extension ASA	2002-2009	
Hailin Zhang	Fellow, ASA	2006, 2007, 2008	2008
Hailin Zhang	Fellow, SSSA	2007, 2008, 2009	2009
Hailin Zhang	Sarkeys Distinguished Prof	2004	
Hailin Zhang	James Whatley Award, OSU	2005	2005
Brian Carter	ASA, Fellow	2002	
Brian Carter	SSSA, Fellow	2002	
Robert Mullen	SSSA, Clark Soil Biology	2002	
Robert Mullen	SSSA Emil Truog Award	2004	2004
James Schepers	SSSA Professional Service	2003	2003
James Schepers	SSSA Intl. Soil Science	2005-2009	
John Lamb	ASA Fellow	2005-2007	2007
John Lamb	SSSA Fellow	2005-2009	
Kyle Freeman	SSSA Emil Truog Award	2006	
Brian Arnall	ASA Larsen Memorial	2006, 2007	
Newell Kitchen	ASA Fellow	2006, 2007	2007
Newell Kitchen	SSSA Fellow	2008	2008
Kefyalew Girma	Syngenta ASA	2006	
Kefyalew Girma	ASA Young Crop Scientist	2007	
Jeff Edwards	ASA Early Career Award	2007	2007
Richard Ferguson	ASA Werner Nelson	2007, 2008, 2009 2010	2010
Mike Stewart	ASA Fellow	2007, 2008, 2009	
David Porter	ASA Fellow	2009	2009
David Porter	CSSA Fellow	2010	2010
Brian Arnall	Emil Truog Award	2009	
Daniel Edmonds	Gerald Mott Scholarship	2009	
Chad Godsey	Early Career Prof. Award	2009	

TOTAL

123

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Committees 2010

Tim Kock, PhD Dissertation. Employers and Educators Perceptions of Job-Related Competencies Needed by Entry-Level International Development Agents.

Jerry May, MS Thesis.

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The 50 Most-Frequently Cited Articles

in Agron J as of July 1, 2010 – updated monthly

1. M. S. McIntosh
Analysis of Combined Experiments
Agron. J. Jan 01, 1983; 75: 153-155.
(In "NOTE") [\[Abstract\]](#) [\[PDF\]](#)
2. M. E. Cerrato, A. M. Blackmer
Comparison of Models for Describing; Corn Yield Response to Nitrogen Fertilizer
Agron. J. Jan 01, 1990; 82: 138-143.
(In "SOILS") [\[Abstract\]](#) [\[PDF\]](#)
3. Dana L. Dinnes, Douglas L. Karlen, Dan B. Jaynes, Thomas C. Kaspar, Jerry L. Hatfield, Thomas S. Colvin, Cynthia A. Cambardella
Nitrogen Management Strategies to Reduce Nitrate Leaching in Tile-Drained Midwestern Soils
Agron. J. Jan 01, 2002; 94: 153-171.
(In "REVIEW AND INTERPRETATION") [\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)
4. K. J. Moore, L. E. Moser, K. P. Vogel, S. S. Waller, B. E. Johnson, J. F. Pedersen
Describing and Quantifying Growth Stages of Perennial Forage Grasses
Agron. J. Nov 01, 1991; 83: 1073-1077.
(In "NOTE") [\[Abstract\]](#) [\[PDF\]](#)
5. William R. Raun, Gordon V. Johnson
Improving Nitrogen Use Efficiency for Cereal Production
Agron. J. May 01, 1999; 91: 357-363.
(In "REVIEW AND INTERPRETATION") [\[Abstract\]](#) [\[PDF\]](#)

First Quarter

Subject	Safety Training Reply
From	vickie.brake@okstate.edu
To	Brake, Vickie
Sent	Thursday, January 28, 2010 10:46 AM

Status

Faculty

CWID:

10065196

First Name:

William

MI:

R

Last Name:

Raun

Department

Plant and Soil Sciences

Campus Address:

044 N Ag Hall

Phone Number:

405 744 6418

Check which subject you chose for this training section

Fire Ants

Completed training

yes

Date submitted

Jan 28, 2010

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<http://dasnr11.dasnr.okstate.edu:9080/siteforms/pass-forms/safety-form>

Second Quarter

Subject	Second Quarter Safety Training Reply
From	vickie.brake@okstate.edu
To	Brake, Vickie
Sent	Thursday, May 06, 2010 12:35 PM

Status

Faculty

CWID:

10065196

First Name:

William

MI:

R

Last Name:

Raun

Department

Plant and Soil Sciences

Campus Address:

044 N. Ag Hall

Phone Number:

405-744-6418

Check the subject choosen for this training section.

OSU Tornado Safety Tips Module

Completed Training

yes

Date submitted

May 06, 2010

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<http://dasnr11.dasnr.okstate.edu:9080/siteforms/pass-forms/safety-form>

Third Quarter

Subject	Safety Training Reply Third Quarter
From	vickie.brake@okstate.edu
To	Brake, Vickie
Sent	Thursday, August 12, 2010 2:35 PM

Status

Faculty

CWID:

10065196

First Name:

William

MI:

R

Last Name:

Raun

Department

Plant and Soil Sciences

Campus Address:

044 N Ag Hall

Phone Number:

405-744-6418

Complete the following Hazard Communication, Your Right to Know Quiz

1. Which of the following will be found on a Material Safety Data Sheet (MSDS)?

All of the Above

2. The yellow portion of an NFPA diamond and HMLS label will represent:

Instability Hazard

3. Employee exposure report forms should only be filled out if you have suffered an acute (immediate) chemical injury such as an acid burn.

False

4. A "4" located in the red portion of an HMLS label indicates that a product:

Has a flash point below 73 degrees F, and a boiling point below 100 degrees F

5. By law, you must receive hazard communications training within the first 30 days of employment.

True

6. Any unattended container with a substance shall have a label to identify the contents of the container.

True

7. Do you know where the MSDSs for your department are kept?

Yes

8. Which of the following is NOT one of your rights concerning material safety data sheets?

Your employer must individually cover ALL the MSDAs for substances you use in an annual training session.

9. You have the right to have your own copy of OSU's written hazard communications program.

True

10. If you have a question about a chemical or product, you may consult:

All of the above
Completed training
yes

Date submitted
Aug 12, 2010

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Fourth Quarter

Subject	Safety Training Reply - 4th Suspicious Package Training
From	vickie.brake@okstate.edu
To	Brake, Vickie
Sent	Monday, October 11, 2010 10:02 AM

Status

Faculty

CWID:

10065196

First Name:

William

MI:

R

Last Name:

Raun

Department:

Plant and Soil Sciences

Campus Address:

044 N. Ag Hall

Phone Number:

405-744-6418

Complete the following "Suspicious Package Training" Quiz

1. Skin or cetaceous form first appears as a rash or blister that may resemble a bite, progressing to a painless ulcer with a black area in the center.

True

2. Inhalational forms represents 95% of cases of human anthrax.

False

3. The risk of contracting any disease from the outside of any envelope is extremely low.

True

4. Fill in the blank: Mail _____ a return address should be considered suspicious.

without

5. Mail addressed with a full name and title should be suspicious.

False

6. Which of the answers below are a sign of suspicious mail?

All the above

7. Packages emitting an unusual odor should be considered suspicious.

True

8. Fill in the blank: If a piece of mail or package looks _____, it should be considered suspicious.

Uneven

9. What can be a sign of a suspicious mail?

All the above

W.R. Raun
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Completed training
yes

Date submitted

Oct 11, 2010

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<http://dasnr11.dasnr.okstate.edu:9080/siteforms/pass-forms/safety-form>