

CURRICULUM VITAE

PAUL R. WECKLER

Biosystems & Agricultural Engineering Department
Oklahoma State University
April 2024

Paul R. Weckler, Ph.D., P.E., Fellow ASABE
Professor Emeritus

PROFESSIONAL PREPARATION

- 1989 Ph.D.** Agricultural Engineering, Oklahoma State University, Stillwater, Oklahoma
USDA National Needs Graduate Fellow
Doctoral Dissertation: *"Optical Range-finding from Image Focus"*
- 1984 M.S.** Agricultural & Irrigation Engineering, Utah State University, Logan, Utah
Masters Thesis: *"Use of Surge Flow to Control Runoff in Furrow Irrigation,"*
- 1982 B.S.** Agricultural Engineering, California Polytechnic State University, San Luis Obispo, Calif.
Senior Project: *"The Redesign of an Irrigation System to Reduce Operating Costs,"* Prjct# 82-0677
Graduated with Honors

POST-DOCTORAL PROFESSIONAL EXPERIENCE

- 2016-2024 Professor, Biosystems & Agricultural Engineering Dept.
Oklahoma State University, Stillwater, Oklahoma
- 2019 Visiting Scientist, Institute of Water Saving Agriculture in Arid Areas of China
NW A&F Univ., Yangling, Shaanxi Prov., China. May 25 -- July 1, 2019
- 2017-2018 Visiting Professor, College of Information & Electrical Engineering,
China Agricultural Univ., Beijing, China. Summer 2017-2018
- 2006-2016 Associate Professor, Biosystems & Agricultural Engineering Dept.
Oklahoma State University, Stillwater, Oklahoma
- 2013-2015 Visiting Professor, Zhongkai Univ. of Agriculture & Engineering, Guangzhou, China
- 2013 Visiting Scientist, Institute of Water Saving Agriculture in Arid Areas of China
NW A&F Univ., Yangling, Shaanxi Prov., China. Aug. 1 -- Nov. 1, 2013
- Visiting Professor, Dept. of Agricultural Engineering,
China Agricultural Univ., Beijing, China. Nov. 1 -- Dec. 1, 2013
- Visiting Professor, Dept. of Agricultural Engineering,
South China Agricultural Univ., Guangzhou, China. Dec. 1 -- Dec. 15, 2013
- 2000-2006 Assistant Professor, Biosystems & Agricultural Engineering Dept.
Oklahoma State University, Stillwater, Oklahoma
- 1997-2000 Assistant Professor, BioResource and Agric. Engineering Dept. & Food Science and Nutrition Dept.
California Polytechnic State University, San Luis Obispo, CA
- 1996-1997 Senior Engineer, Infrared Product Group
Litton Electro-Optical Systems, Tempe, AZ
- 1990-1996 Project Engineer, & Engineering Group Leader, Electro-Optical Systems Group
Aeromet, Inc., Tulsa, Oklahoma

PROFESSIONAL AFFILIATIONS

American Society of Agricultural and Biological Engineers (ASABE)
Society of Manufacturing Engineers (SME)
Past Member of SME - Machine Vision Technical Advisory Committee
Institute of Electrical and Electronic Engineers (IEEE)

Society of Photo-Optical Instrumentation Engineers (SPIE)
Tau Beta Pi (National Engineering Honor Society)
Alpha Epsilon (National Agricultural Engineering Honor Society)
Gamma Sigma Delta (The Honor Society of Agriculture)

HONORS AND AWARDS

Elected and inducted as a Fellow of the American Society of Agricultural and Biological Engineers in 2024.
2019 recipient of the ASABE Massey-Ferguson Educational Gold Medal for his dedication in teaching and student development through academic and culturally diverse learning.
Selected to be Facilitator/mentor for the 2015-2016 OK Educators' Leadership Academy (ELA) Outstanding Professors' Academy -- OK Regents for Higher Ed
2015 American Society of Agricultural and Biological Engineers Superior Paper Award. For the article, "*Test Method for Precision Seed Singulation Systems*," published in Transactions of the ASABE.
2014-2015 OK Educators' Leadership Academy (ELA) *Outstanding Professors' Academy* -- OK Regents for Higher Ed
2013 OK Regents for Higher Ed. - Business Partnership Excellence Award, April 29, 2013
Outstanding OSU Service Learning Faculty Award. April 2012
Merrick Foundation Teaching Award, 2010 OSU Convocation
2nd place Boyd-Scott Research Award paper at the 2010 ASABE Annual meeting
Outstanding paper award from the Information and Electrical Tech. Division of ASABE, 2009
Alpha Epsilon Honor Society -- 2004-2005, 2012-2013, BAE Faculty Distinguished Service Award
Outstanding BAE Faculty Award by the OSU ASAE Student Branch, 2000-2001
1st place, ASABE - AGCO National Student Design Competition, 2003- 2004, 2005-06 & 2006-07
2nd place, ASABE - AGCO National Student Design Competition, 2002- 2003, & 2011-2012
3rd place, ASABE - AGCO National Student Design Competition, 2017-2018

Certification Or Licensing

Professional Engineer - Lic. # PE21352 Okla. Bd of Reg. for Prof. Engineers & Land Surveyors
Certified Engineer-in-Training (EIT), Division of Registration, State of Utah 1982

PROFESSIONAL ACTIVITIES

Dr. Weckler is a registered, professional engineer with over twenty years of experience in sensor and instrumentation engineering. He is a Professor of Biosystems and Agricultural Engineering at Oklahoma State University. His responsibilities include: teaching undergraduate and graduate level courses (including the capstone senior design project courses), and conducting interdisciplinary research and development in the area of sensors, instrumentation and automation. His areas of expertise include: instrumentation, sensors & controls, digital image/signal processing, electro-mechanical system design, electro-optical sensor systems, automated Smart Machines, food & crop processing, and system integration & testing.

FUNDING RECEIVED:

Oklahoma Center for the Advancement of Science and Technology
Accelerating Integration of Manufacturing 4.0 Technologies Approx. \$50,000 over 2 yrs

Seed Grant -- The Rural Renewal Initiative Approx. \$100,000 over 2 yrs
A multi-dimensional approach for quantifying drought impacts on Oklahoma's rural communities, and implications for water management

Oklahoma Alliance for the Manufacturing Excellence, Inc. and NIST Total Project Costs: \$445,489
Enhancing the Oklahoma Alliance for Manufacturing Excellence with Applications Engineers in Rural Areas

Seed Grant -- The Rural Renewal Initiative <i>Sustainable Agriculture and Energy Systems for Rural Communities</i>	Approx. \$100,000 over 2 yrs
Department of Energy (DOE ARPA-E) Establishing validation sites for field level emissions quantification from Grain Sorghum in So. Great Plains	Total Project Costs: \$3,608,527
2020-2021 Wentz Research Scholarship TITLE: <i>Investigation of roughing filter parameters for pretreatment of biosand filter influent</i> Alissa Meek, undergrad student	Total \$5000 Faculty Mentor: Paul Weckler
Seed Grant -- The Rural Renewal Initiative Technological Innovations for Rural Broadband and IoT Connectivity	Approx. \$100,000 over 2 yrs
The Rural Renewal Initiative at OSU OSU Tier 1 Research Initiative (HiBAR) Grant	Approx. \$1.1 million over 3 yrs
OSU Tier 1 Research Initiative (HiBAR semi-finalist) Planning Grant	Total \$15,000
2017-2018 CASNR Undergrad Research Grant -- Alissa Meek TITLE: <i>Investigation of roughing filter parameters for pretreatment of biosand filter influent</i>	Faculty Mentor Total \$1000
2016-2017 BAE Senior Design Project Funding	Total \$ 11,158
AGCO Corp. 2016-18, Head-to-Head Comparison of Soil Sensor Systems	Total \$30,161
Visiting Scientist Research support, Dr. Changyuan Zhai, Northwest Agriculture & Forestry University, Yangling, Shaanxi, China	Faculty Mentor Total \$3,600
Garver Engineering - BAE Senior Design grant	Total \$800
2016-2017 Wentz Research Grant -- Josh Seaberg TITLE: <i>Applying Economical Multistep Mass Water Treatment Technologies in Developing Nations</i>	Faculty Mentor Total \$500
2015-2016 BAE Senior Design Project Funding	Total \$6071
CASNR/OAES 2015-16 Grant -- Undergraduate Research Scholar <i>Weather Impacts on UAV Flight Availability for Agricultural Purposes in Oklahoma</i>	Faculty Mentor Total \$1000
Visiting Scientist research support, 2015-16, Dr. Liankuan Zhang, South China Agricultural University, Guangzhou, China	Total \$3,300
OAES-MIAP 2015 Student Assistantship TITLE: Improved Water Filtration for Safe Drinking Water and Sanitation in Developing Countries -- 0.5 GRA	Co-PIs: Tim Bowser & Paul Weckler
BAE Senior Design Project Funding (excluding NASA X-Hab)	Total \$8262
MacDon M155 Self-Propelled Windrower, 2015	Approx. value > \$80,000
2015-2016 Wentz Research Grant -- Josh Seaberg Title: <i>Disinfection of Mass Quantities of Water for Developing Nations</i>	Faculty Mentor Total \$5000
2014-2015 Freshman Research Scholar -- Callie Carpenter, <i>Comparing Water Filter Effectiveness -- How effective are different types of water filters at removing bacteria?</i>	Faculty Mentor
NASA eXploration Habitat (X-Hab) 2015 Academic Innovation Challenge. <i>Deployable Greenhouse for food production on long-duration exploration missions.</i>	Co-Principal Investigator Total \$20,412
Visiting Scientist research support, Dr. B. Gaikwad,	

Central Institute of Agricultural Engineering, Bhopal, India	Total \$4,500
OSU Division of Agricultural Sciences & Natural Resources	Sabbatical Leave -- Fall 2013
OSU Institute for Teaching and Learning Excellence (ITLE) Provost's Teaching Research Grant 2013-2014	Co-Principal Investigator
Linking Freshmen and Senior Engineering Design Teams: Engaging Early Academic Career Students in Engineering	Total \$1,500
CEAT New Equipment Proposal from Technology Fees	Total \$80,535
OSU Planning Grants for Establishing Interdisciplinary Programs Development of a Multidisciplinary Program in Unmanned Systems	Co-Principal Investigator Total \$28,800
OSU Planning Grants for Establishing Interdisciplinary Programs National Institute for Whole chain Traceability and Food Safety	Co-Principal Investigator Total \$38,650
USDA-NIFA, Specialty Crop Research Initiative Defining Research and Extension Priorities for Pecan Production, Processing, Marketing and Consumer Utilization	Co-Principal Investigator Total \$50,000
USDA Special Grant – 7/1/10 - 6/30/12 Harvesting, Preservation & Processing For Horticultural and Alternate Commodities	Co-Principal Investigator Total \$161,936
USDA-NIFSI - sub-contract to Univ. Of Nebraska 2/28/09 – 7/31/13 Improving the Safety Of Prepared, but not Ready-To-Eat, Microwaveable Foods Through Heat Transfer and Pathogen Destruction Modeling	Co- Principal Investigator Total \$25,000
USDA-CSREES, Higher Ed. Challenge Grant Interdisciplinary Innovation Education to Solve Real Business and Design Problems	Co-Principal Investigator Total \$465,595
USDA Special Grant – 7/1/09-6/30/11 Quality Preservation and Assessment for Horticultural and Alternate Commodities	Co-Principal Investigator Total \$162,218
USDA Special Grant – 7/1/08-6/30/10 Systems for Quality Preservation for Horticultural and Specialty Commodities	Co-Principal Investigator Total \$172,234
USDA-ARS Specific Cooperative Agreement – 9/30/05-8/31/10 Large Woody Debris Structures in Stream Channels	Principal Investigator Total \$26,460
OSU New Product Development Center – 2008 Design of an Electrolysis Cell	Principal Investigator Total \$4,554
OSU New Product Development Center – 2008 Design of an Arena Drag	Principal Investigator Total \$3,624
Oklahoma Biofuel Initiative Harvesting and Handling Equipment to Meet the Demands Of Oklahoma Lignocellulosic Biomass Under Indigenous Growing Condition	Co-Principal Investigator Total \$160,812
OSU New Product Development Center – 2006 Design of A Hydraulic Tree Shear	Principal Investigator Total \$5,754
USDA Special Grant – 7/1/06-6/30/08 Quality Evaluation, Preservation and Extraction Processing Of Horticultural And Alternate Commodities	Co-Principal Investigator Total \$231,055
The Charles Machine Works, Inc. – 10/1/06-12/31/07 Investigation of Intruder Detection Technology	Co-Principal Investigator Total \$31,615

Oklahoma Agricultural Experiment Station (OAES) & Oklahoma Cooperative Extension Service (OCES)	
TIP Grant – 7/1/06-9/30/08	Co-Principal Investigator
Development of Laser-Based Biosensor Technologies	Total \$75,000
Oklahoma Agricultural Experiment Station (OAES) & Oklahoma Cooperative Extension Service (OCES)	
TIP Grant – 7/1/06-9/30/08	Co-Principal Investigator
The Future of Geospatial Technologies in Agriculture	Total \$30,000
OSU Centennial Scholars Program	Co-Principal Investigator
Identifying Field-Scale Insect Infestation Patterns Using Sensor Technologies	
Sitlington Enriched Graduate Scholarship Program	Co-Principal Investigator
Post Harvest Food Quality Sensor Design	Total \$15,000
USDA-ARS Specific Cooperative Agreement – 9/30/05-8/31/10	Principal Investigator
Large Woody Debris Structures in Stream Channels	Total \$26,460
USDA Special Grant – 7/1/05-6/30/07	Co-Principal Investigator
Harvesting, Handling and Quality Preservation For Horticultural And Alternate Commodities	Total \$185,197
2004-2005 FUNDING FOR BAE 4012/4022 SENIOR ENGINEERING DESIGN PROJECT I & II	
UniBridge Scale Systems Inc., Knowles, OK	\$4900 equip. purchased Total \$4,900
VMI, Cushing, OK	\$1000 cash plus \$650 equip. purchased Total \$1,650
Charles Machine Work – Ditch Witch, Perry, OK	\$2800 equip. purchased Total \$2,800
Agri-Industries Inc., Cordell, OK	\$2855 cash plus \$42,000 equip. purchased Total \$44,855
Rockin' B Bucking Machines, Cheyenne, OK	\$800 cash plus \$1750 equip. purchased Total \$2,550
All Terrain Cedar Saw LLC, Vici, OK	\$513 cash plus \$767 equip. purchased Total \$1,280
Approx. Overall Expenditures on BAE 4012/4022 (by OSU & outside sponsors)	~ \$65,000
USDA-CSREES Special Grant 7/1/04-6/30/06	Co-Principal Investigator
Preservation, Handling, and Processing of Horticultural and Alternate Commodities	Total \$186,654
2003-2004 Funding for BAE 4012/4022 Senior Engineering Design Project I & II	
Scotts Pet Products \$5500 cash plus \$9000 equip. purchased	Total \$14,500
USDA Special Grant – 7/1/03-6/30/05	Co-Principal Investigator
Harvesting, Processing and Storage of Horticultural and Alternate Commodities	Total \$206,549
OSU New Product Development Center – 2002	Co-Principal Investigator
Development of Sprig Planter Controller	Total \$55,000
Food & Ag. Products Center Research Initiative Program – FRIP 2002	Co-Principal Investigator
Non-Destructive Methods for Predicting Beef Tenderness	Total \$40,000
	(combined with proposal below)
Food & Ag. Products Center Research Initiative Program – FRIP 2002	Co-Principal Investigator
Assessment of Beef Tenderness Using Dual-Energy X-Ray Absorption	Total \$24,800
	(combined with above proposal)
Food & Ag. Products Center Research Initiative Program - FRIP 2001	Co-Principal Investigator
Biofuel from Hog Slaughter By-Products	Total \$45,625

REFEREED JOURNAL ARTICLES

Total Published 52

- Zhai C, Qiu W, Weckler P, He X and Jabran K., 2023. *Editorial: Advanced application technology for plant protection: Sensing, modelling, spraying systems and equipment*. *Frontiers in Plant Science*. 14:1113359. doi: 10.3389/fpls.2023.1113359
- King, A., Robinson, J.S., Ochsner, T.E., Weckler, P., Woodring, M., 2022, *Residents' perceptions of the need and potential for rural renewal in two farming-dependent counties*. *Advancements in Agricultural Development*, 3 (4), 17-29
- Zhang, L., Xia, C., Xiao, D., Weckler, P., Lan, Y. and Lee, J.M., 2021. *A coarse-to-fine leaf detection approach based on leaf skeleton identification and joint segmentation*. *Biosystems Engineering*, 206, pp.94-108.
- Sun, L., Guo, H., Liu, B., Wu, S., Weckler, P.R. and Yang, J., 2021. *Characterizing erosion processes on a convex slope based on 3D reconstruction method*. *Geoderma*. 402, p.115364.
- Seaberg, J., Weckler, P., Ringer, J. and Wilber, G., 2020. *Construction and testing of a drinking water disinfection and filtration system for developing nations*. *International Journal for Service Learning in Engineering, Humanitarian Engineering and Social Entrepreneurship*, 15(1), pp.33-53.
- Song, X., Gao, X., Weckler, P.R., Zhang, W., Yao, J., Wu, Y., Zou, Y., Wu, P., Zhao, X. and Siddique, K.H., 2020. *An In-Situ Rainwater Collection and Infiltration System to Improve Plant-Available Water and Fine Root Growth for Drought Resistance*. *Applied Engineering in Agriculture*, 36(5), pp.807-814.
- Zhai, C., Long, J., Taylor, R., Weckler, P. and Wang, N., 2020. *Field scale row unit vibration affecting planting quality*. *Precision Agriculture*, 21(3), pp.589-602. <https://doi.org/10.1007/s11119-019-09684-4>
- Wang, Y., Weckler, P. R., Liu, B., Zhang, H., Zhao, Y., Han, W. (2019). *Signal transmission and node deployment of a 2.4 GHz wireless sensor network: A case study in a persimmon orchard*. *Engineering in Agriculture, Environment and Food*. Volume 12, Issue 2, 2019. Pages 204-216. ISSN 1881-8366. (<https://doi.org/10.1016/j.eaef.2019.01.001>).
- Zhai, C & Zhao, C & Wang, N & Long, J & Wang, X & Weckler, Paul & Zhang, H. (2018). *Research progress on precision control methods of air-assisted spraying in orchards*. *Transactions of the Chinese Society of Agricultural Engineering*. 34. 1-15. 10.11975/j.issn.1002-6819.2018.10.001.
- Seaberg, J., P. R. Weckler, G. Wilber, J. Ringer. *Comparison of Locally Generated Chemical Disinfectants for Drinking Water Treatment in Developing Nations*. *International Journal for Service Learning in Engineering*. Vol. 13, No. 1, pp. 67-83, Spring 2018. ISSN 1555-9033. (<http://www.ijlsle.org>)
- Yazgi, A., Taylor, R.K., Navid, H., Weckler, P. *Performance Modeling and Seed Releasing Characteristics of a Corn Planter Metering Unit Using Response Surface Methodology*. 2017, *Applied Engineering in Agriculture*. 33(2): 181-189. (doi: 10.13031/aea.11681)
- Ju, X.L., Wu, P.T., Weckler, P.R. and Zhu, D.L., *Simplified Approach for Designing Length of Microirrigation Laterals*. 2017, *Applied Engineering in Agriculture*, 33(1), pp.75-82. (doi: 10.13031/aea.11882)
- Li H, Zhai C, Weckler P, Wang N, Yang S, Zhang B. *A Canopy Density Model for Planar Orchard Target Detection Based on Ultrasonic Sensors*. *Sensors* (Basel, Switzerland). 2017; 17(1):31. doi:10.3390/s17010031.
- Zhang, L & Weckler, P. & Xiao, D. (2016). *Automatic leaf surface region segmentation from crop image*. *Journal of Jiangsu University (Natural Science Edition)*. 37. 663-669. 10.3969/j.issn.1671-7775.2016.06.008.
- Koller, A. A., R. K. Taylor, W. B. Raun, P. R. Weckler, M. D. Buser. *Modelling and Validation of Maize Seed Orientation by Pushing*, *Biosystems Engineering*, Volume 151, November 2016, Pages 338-349, ISSN 1537-5110, <http://dx.doi.org/10.1016/j.biosystemseng.2016.09.011>.

Bowser, T., P. R. Weckler, M. Bugg, E. Lam, J. F. Chamberlain. *Improved Field Methods for Construction of Concrete Biosand Water Filter Housings*. International Journal for Service Learning in Engineering. Vol. 11, No. 1, pp. 32-50, Spring 2016. ISSN 1555-9033. (<http://www.ijlsle.org>)

Koller, A., Torres, G., Buser, M., Taylor, R., Raun, B. And Weckler, P. (2016) *Statistical Model for the Relationship Between Maize Kernel Orientation and Seed Leaf Azimuth*, Experimental Agriculture. 52(3), pp. 359–370. doi: 10.1017/S0014479715000149.

Zhang, L., P. Weckler, N. Wang, D. Xiao, X. Chai. *Individual Leaf Identification from Horticultural Crop Images Based on the Leaf Skeleton*, Computers and Electronics in Agriculture, Volume 127, September 2016, Pages 184-196, ISSN 0168-1699, <http://dx.doi.org/10.1016/j.compag.2016.06.017>.

Ju, X., P. Weckler, P. Wu, D. Zhu, X. Wang, Z. Li. *New Simplified Approach for Hydraulic Design of Micro-Irrigation Paired Laterals*. Transactions of the ASABE. 58(6): 1521-1534. (doi: 10.13031/trans.58.11092) @2015

Fox, G., P. Weckler, D. Thomas. 2015 *Linking Freshmen and Senior Engineering Design Teams: Engaging Early Academic Career Students in Engineering Design*. Advances in Engineering Education. Winter2015, Vol. 4 Issue 3, p1-14. 14p.

Sun, Y., W. Han, P. Cao, J. Ning, S. Chen, P. Weckler. 2015 *Prediction of Moisture Content in Corn Leaves Based on Near-infrared Spectroscopy and Hyperspectral Image Chemometric Analysis*. Transactions of the ASABE. 58(3): 531-537. (doi: 10.13031/trans.58.10645)

Koller, A., G. Torres, M. Buser, R. Taylor, W. Raun, P. Weckler. 2015 *Relationship between Maize Kernel Orientation and Seed Leaf Azimuth Follows Von Mises Distribution*. Journal of Experimental Agriculture. available on CJO2015. doi:10.1017/S0014479715000149.

Ju, X., W. Pute, P. Weckler, D. Zhu, L. Zhang, *New Simplified Method for Hydraulic Design of Micro-irrigation Laterals Based on Emission Uniformity*. Journal of Drainage and Irrigation Machinery Engineering. 33(8):691-700 · July 2015

Weckler, P., Jones, C., Bowser, T., Hardin, J., Ning Wang , , Franzen , A., Mathanker, S., Maness, N. and Smith, M. 2015. *Technologies For Enhancing Pecan Production and Processing*. Acta Hort. (ISHS) 1070:235-243

Navid, H., R. Taylor, A. Yazgi, N. Wang, Y. Shi, P. Weckler. *Detecting Grain Flow Rate Using a Laser Scanner"* Transactions of the ASABE. 58(5): 1185-1190. (doi: 10.13031/trans.58.11097) @2015

Ju, X., W. Pute, P. Weckler, L. Zhang, D. Zhu, *Hydraulic Design of Microirrigation Paired Tapered Laterals Based on Energy Gradient Line Method*. Transactions of the Chinese Society for Agricultural Machinery (EI). doi:10.6041/j.issn.1000-1298. 2015.12.007 Dec. 2015

Liu, B., W. T. Han, P. Weckler, Y. Wang, K. X. Song, 2014. *Detection Model for Effect of Soil Salinity and Temperature on FDR Moisture Content Sensors*. Transactions of the ASABE. 30(4): 573-582.

Koller, A. A., Y. Wan, E. A. Miller, P. R. Weckler, R. K. Taylor, 2014. *Test Method for Precision Seed Singulation Systems*. Transactions of the ASABE. 57(5): 1283-1290.

Mathanker, S. K., and P. R. Weckler. 2014. *New Thresholding Methods for Unimodal Images of Food and Agricultural Products*. GSTF Journal of Agricultural Engineering 1(1):12-21.

Khanchi, A. C.L. Jones, B. Sharma, R.L. Huhnke, P. Weckler, N.O. Maness, *An empirical model to predict infield thin layer drying rate of cut switchgrass*, Biomass and Bioenergy, Volume 58, November 2013, Pages 128-135

Porter, W. M., Y. Shi, J. A. Rascon, R. K. Taylor, P. Weckler, 2013. *Laboratory Evaluation of a Turn Compensation Control System for a Ground Sprayer*. Applied Engineering in Agriculture. 29(5): 655-662.

S. K. Mathanker, P. R. Weckler, and T. J. Bowser. 2013. *X-Ray Applications In Food And Agriculture: A Review*, Transactions of the ASABE. 56(3): 1227-1239.

Evert, A., Blackwell, C., Tilley, D., Weckler, P. & Holcomb, R., 2013. *Students' Perceptions of Communications and Course Motivation Provided by Faculty*. Journal of Natural Resources and Life Sciences Education. Vol. 42 No. 1, p. 91-97.

Hardin, J. A., P. R. Weckler, and C. L. Jones. 2013. *Microwave Backscatter Response of Pecan Tree Canopy Samples for Estimation of Pecan Yield in situ Using Terrestrial Radar*. Computers and Electronics in Agriculture. 90 (2013): 54-62.

S. K. Mathanker , P. R. Weckler, N. Wang. 2013. *THz Applications in Food and Agriculture: A Review*, Transactions of the ASABE. 56(3): 1213-1226.

Hardin, J. A., C. L. Jones, P. R. Weckler, N. O. Maness, J. W. Dillwith, and R. D. Madden. 2013. *Rapid in situ Quantification of Leaf Cuticular Wax Using FTIR-ATR*. Transactions of the ASABE 56(1): 331-339.

Hardin, J. A., M. W. Smith, P. R. Weckler, and B. S. Cheary. 2012. *In Situ Measurement of Pecan Leaf Nitrogen Concentration Using a Chlorophyll Meter and Vis-NIR Multispectral Camera*. HortScience 47(7): 955–960.

S.K. Mathanker, P.R. Weckler, T.J. Bowser, N. Wang, N.O. Maness, *AdaBoost Classifiers for Pecan Defect Classification*, Computers and Electronics in Agriculture, Vol. 77, Issue 1, June 2011, Pgs 60-68, ISSN 0168-1699.

Al-Saqer, S.M., P. Weckler, J. Solie, M. Stone, A. Wayadande, 2011. *Identification of Pecan Weevils through Image Processing*. American Journal of Agricultural and Biological Sciences, Volume 6, Issue 1, Pages 69-79

S. K. Mathanker, P. R. Weckler, N. Wang, T. Bowser, N. O. Maness. *Local Adaptive Thresholding of Pecan X-Ray Images: Reverse Water Flow Method*. Transactions of the ASABE. 53(3): 961-969. 2010

F. Ding, C. L. Jones, P. Weckler, 2009, *Detection and Identification of Stored-Grain Insects with RF/Microwave and Neural Network Technology*, Transactions of the ASABE. 52(6): 2105-2114.

F. Ding, C. Jones, P. Weckler, *RF/Microwave Technology Application for Identification of Stored-Grain Insects Under Electric Fields*, Sensing and Instrumentation for Food Quality and Safety, Vol. 3, No. 4. (1 December 2009), pp. 227-238.

T. J. Bowser, R. S. Frazier, P. R. Weckler, S. J. Kowalski, 2009, *Optimizing Jerky Drying Time with Minimal Product Impact*, The Open Food Science Journal, Volume 3, ISSN: 1874-2564, pp.79-83 (5) doi: 10.2174 / 1874256400903010079

R. Choudhary, T.J. Bowser, P. Weckler, N.O. Maness, W. McGlynn, *Rapid estimation of lycopene concentration in watermelon and tomato puree by fiber optic visible reflectance spectroscopy*, Postharvest Biology and Technology, Volume 52, Issue 1, April 2009, Pages 103-109

T.J. Bowser, P.R. Weckler, 2008 *Validation Guidelines for a Jerky Pasteurization Process in a Low-Cost Dehydrator*, The Open Food Science Journal. Volume 2, ISSN: 1874-2564 pp.43-48 (6)

C. L. Jones, P. R. Weckler, N. O. Maness, R. Jayasekara, M. L. Stone, D. Chrz , 2007 *Remote Sensing to Estimate Chlorophyll Concentration Using Multi-Spectral Plant Reflectance*, Transactions of the ASABE. 50(6): 2267-2273

N. Kotwaliwale, P.R. Weckler, G.H. Brusewitz, G.A. Kranzler, 2007 *Non-destructive quality determination of pecans using soft X-rays*, Postharvest Biology and Technology 45 (2007) 372–380

N. Kotwaliwale, P.R. Weckler, J. Subbiah, G.H. Brusewitz, G.A. Kranzler, 2007 *Calibration of a Soft X-Ray Digital Imaging System for Biological Materials*, Transactions of the ASABE. 50(2): 661-666. @2007

N. Kotwaliwale, P.R. Weckler, G.H. Brusewitz, 2006 *X-ray Attenuation Coefficients Using Polychromatic X-ray Imaging of Pecan Components*, Journal of Biosystems Engineering. Vol. 94(2):199-206.

T.J. Bowser, P.R. Weckler, K.N. Patil, and C. DeWitt, 2005 *Design and Testing of a Low-Cost, Pilot-Scale Batch Gasifier for Food Processing Byproducts*, Transactions of the ASABE. Vol. 21(5): 901-906

N. Kotwaliwale, G.H. Brusewitz, P.R. Weckler, 2003. *Physical Characteristics of Pecan Components: Effect of Cultivar and Moisture Content*, Transactions of the ASABE. Vol. 47(1): 227-231.

T.J. Bowser, P.R. Weckler, R. Jayasekara, 2003. *Process Design and Operation of a Steam Injection Heater for Viscous Food and Agricultural Products*, ASABE Applied Engineering in Agriculture. Vol. 19(4):447-451.

INVITED PAPERS & PRESENTATIONS

Total Presented 41

Ochsner, T., Hagerman, A., Krueger, E., Lambert, D., Lambert, L. and Weckler, P., 2021, April. *Drought severity and impact relationships: a multidimensional case study of recent droughts in the south-central semiarid prairies of the United States*. In EGU General Assembly Conference Abstracts (pp. EGU21-6530).

Ochsner, T., Meek A., Muller L., Weckler P., Datta S., Taghvaeian S., Sibley M., and Ritchie L. (2020) *Use of Soil Moisture Data in Agricultural Water Management: On-farm Sensor Research and Perspectives from Irrigators*. presented at the American Geophysical Union (AGU) 2020 Fall (Virtual) Meeting. Dec 10, 2020.

Weckler, P., *Beyond Imagery--Ag Panel Session* at the UAS Tech Forum. Unmanned Aerial Systems Cluster Initiative. August 21-22, 2019. Salina, Kansas

Weckler, P., *Wheat Harvesting and Storage in Oklahoma*. presented at the 4th Annual Yangling Wheat Symposium and Conference, June 4, 2019. Yangling, China.

Weckler, P., *Smart Farming, Digital Agriculture and Big Data*, presented at the Research Symposium, College of Mechanical and Electronic Engineering, Northwest A&F University. June 5, 2019. Yangling, China.

Weckler, P., *Big Data and Digital Agriculture*. presented at the 6th International Federation of Automatic Control (IFAC) Conference on Bio-Robotics (BIROBOTICS 2018), July 12-16, 2018. Beijing, China.

Weckler, P., *Using Big Data and the Internet of Things (IoT) to Manage Tomorrow's Agricultural Production Systems*. presented at the Coalition for Advancing Digital Research and Education (CADRE) Conference at the Wes Watkins Center, Oklahoma State University, Stillwater, OK. April 18, 2018.

Weckler, P., 2017. *The Sky's the Limit: Utilizing Drone Technology in Agriculture And Beyond--Ag Applications Panel*. Great Plains Technology Center Business Development Center. Lawton, OK. Nov. 8, 2017.

Seaberg, J., P. Weckler, G. Wilber, 2017. *Economically viable and locally generated semibatch disinfection and filtration of drinking water for use in developing nations*. 2017 International WaTER Conference. Univ. of Oklahoma. Sep 18-20, 2017. Norman, OK.

Weckler, P., G. Wilber, T. Bowser. 2017. *Demonstration of the OSU-EWB biosand water filter*. 2017 International WaTER Conference. Fears Lab.-Univ. of Oklahoma. Sept. 20, 2017. Norman, OK.

Weckler, P., 2017 *Real-Time Data for Control of Smart Agricultural Machines*. Presented at the China Development Forum and International Conference on Smart Agriculture Innovative Development (ICSaid 2017) held in Beijing from July 7th to 10th, 2017

Weckler, P., 2016 *Soil Moisture Sensing and Precision Agriculture*. National Center for Information Technology in Agriculture (NERCITA). Beijing Academy of Agriculture and Forestry Sciences. Beijing, China. Nov. 9, 2016.

Weckler, P., 2016 *Soil Moisture Sensing and Precision Agriculture*. College of Information and Electrical Engineering. China Agricultural University, Beijing, China. Nov. 10, 2016.

Weckler, P., and B. Arnall. 2017. *UAV Agricultural Uses: Down to Earth Look at Ag*. Noble County OSU Extension. Noble County Fairgrounds. Perry, OK. March 23, 2017

Weckler, P., 2017. *BAE Senior Design Projects at OSU*. National Active and Retired Federal Employees Association (NARFE)-Stillwater Chapter. Feb. 17, 2017

Special Series on Unmanned Aircraft, Part 1: Taking off in New Directions with Unmanned Aircraft
ASABE Resource Magazine. 23(2): 16-22. @2016
Wayne Woldt, John Nowatzki, Randy Price, Dharmendra Saraswat, Paul Weckler

Special Series on Capstone Senior Design: To the Moon and Back. Paul Weckler

ASABE Resource Magazine. 23(5): 17-17. @2016

Weckler, P., 2016 *Weather Impacts on UAV Flight Availability for Agricultural Purposes* 2016 Yangling International Agri-Science Forum, Shaanxi, China. Nov. 6-7, 2016.

Weckler, P., 2016 *Soil Moisture Sensing and Precision Agriculture*. National Center for Information Technology in Agriculture (NERCITA). Beijing Academy of Agriculture and Forestry Sciences. Beijing, China. Nov. 9, 2016.

Weckler, P., 2016 *Soil Moisture Sensing and Precision Agriculture*. College of Information and Electrical Engineering. China Agricultural University, Beijing, China. Nov. 10, 2016.

Weckler, P., 2016 *Weather Impacts on UAV Flight Availability for Agricultural Purposes*. Institute of Environment and Sustainable Development in Agricultural. Chinese Academy of Agricultural Sciences. Beijing, China. Nov. 11, 2016.

Weckler, P., 2016 *UAVs in Agriculture*. 2016 Oklahoma Association of Electric Cooperatives (OAEC) Annual Meeting. Monday, April 11, 2016. OKC, OK

Weckler, P., 2015 *UAVs in Agriculture: OALP/ALO Educational Session and Christmas Banquet*. Agricultural Leadership of Oklahoma (ALO) and Oklahoma Agricultural Leadership Program (OALP) Saturday December 5, 2015. Wes Watkins Center, Oklahoma State University, Stillwater, OK

Weckler, P., and B. Arnall. 2015 *Ag Applications of Drones and UAVs*. **Oklahoma Statewide Women in Agriculture & Small Business Conference**. August 6-7, 2015. Moore Norman Technology Center, Oklahoma City.

Weckler, P., 2015 *Practical Partnerships and Opportunities for Impacting the Global Food Security Issue in the Classroom and Through Hands-on International Experiences*. NAFSA Global Learning Colloquium for the STEM Fields. 2015 NAFSA-Association of International Educators Annual Conference & Expo. May 24-29, 2015. Boston, MA.

Weckler, P., C. Craige, K. Moore, M. Rogers. 2015 *Orchard Sprayer Performance Evaluation*. Oklahoma Pecan Growers Association Meeting. Ardmore, OK. June 11-13, 2015

P. Weckler, Invited by the Association of Overseas Chinese Agricultural, Biological & Food Engineers. *Teaching and Research in Biosystems & Agricultural Engineering in China*. Presented at the Chinese Exchange Forum held at the 2014 ASABE Annual International Meeting. Montreal, Quebec, Canada, July 13-16, 2014.

P. Weckler, *Teaching and Research in Biosystems & Agricultural Engineering in China*. Presented at the 2014 ASABE Oklahoma Section Meeting. Stillwater, OK. Feb. 28, 2014

P. Weckler, et al., *Teaching in a Laboratory Setting*. ITLE Live: Faculty Talk Fridays. The Institute for Teaching and Learning Excellence (ITLE), Oklahoma State University. Oct. 31, 2014

Weckler, P., *Industry-driven Development of Innovative Sensors for Agricultural Production and Processing*. Presented at the National Engineering Research Center for Information Technology in Agriculture, (NERCITA), November 20, 2013 Beijing China

Weckler, P., *Teaching Senior Design with Industry Projects*, presented at the Chinese Forum of Agricultural Engineering Education - Sponsored by the Education Division of China Society of Agricultural Engineers (CSAE), Education Division of China Society of Mechanical Engineers (CSME), Division of Ground-based Machinery Systems (CSME) & organized by the Biological & Ag Engineering College, Jilin Univ., Changchun, China. Sept 14, 2013.

P. Weckler, et al., *Intelligent Sensing for Pecan Production and Processing*, presented at the *Joint International Conference on Smart Agriculture*, (7th ISIITA & 7th CCTA). Presented at the 7th International Symposium on Intelligent Information Technology in Agriculture, (7th ISIITA). The 7th IFIP International Conference on Computer and Computing Technologies in Agriculture, (7th CCTA). Beijing, China. September 18-20, 2013.

Weckler, P., *Remote Sensing in Precision Agriculture - UAV use in Agriculture*. Presented at the 2013 Oklahoma Unmanned Aerial Systems (UAS) Summit. Sponsored by The Unmanned Systems Alliance of Oklahoma (USA-OK). Norman, OK. March 26, 2013.

Weckler, P., et al., *Development of a Low-Cost Small Scale Sanitizer for In-Shell Pecans*. Presented at the 2013 Oklahoma Pecan Growers' Association 83rd Annual Meeting, Ardmore, OK, June 27-29, 2013

P. Weckler, et al., *Technologies for Enhancing Pecan Production and Processing*. 2013 Presented at the 1st International Symposium on Pecans and Other *Carya* in Indigenous and Managed Systems. International Society for Horticultural Science (ISHS). Texas A&M University, College Station, TX, July 17-20, 2013

P. Weckler, *Remote Sensing in Precision Agriculture*, UAVs and Precision Ag - 2012, Noble-Ardmore Dialogue on Precision Agriculture, Samuel Roberts Noble Foundation, Oct. 16, 2012, Ardmore, OK,

P. Weckler, *The Biosystems & Agricultural Engineering Department at OSU*. 2012, County Officers and Deputies Association of Oklahoma workshop, Oklahoma County Commissioners Association meeting, Sept. 6, 2012. Tulsa, OK

P. Weckler, et al., *Design and Implementation of Biosand Water Filters in Seis de Mayo, Honduras*. 2011 University Of Oklahoma International Water Conference, Oct. 24-26, 2011, Norman, OK

P. Weckler, *Combining Engineers Without Borders with Study Abroad*. Special Session on Giving Back to the Profession, 2011 ASABE Annual International Meeting. Louisville, Kentucky.

P.R. Weckler, N. Wang, Franzen, A., & N. Maness. 2010. *Wireless Image Sensor Applications In Agriculture*. The International Symposium on Wireless Sensor Network in Agriculture (ISWSNA2010), November 18-21, 2010, Beijing, China.

P.R. Weckler, *Capstone Senior Design Projects and Quarter-scale Tractor Activities at Oklahoma State University*. Invited lecture at China Agricultural University, November 23, 2010, Beijing, China.

PAPERS & PRESENTATIONS

Total Presented 105

Cathey, D., Weckler, P. (2022). *Sustainable Agriculture and Energy Systems for Rural Communities*. 2022 OSU Rural Renewal Symposium, Stillwater, OK, October 2022.

Young, W., Long, J., Bennett, R., Wang, N., Weckler, P. 2021. *Development of Image-based Data Processing Methods for UAVs in Peanut and Cotton Production*. presented at the 2021 ASABE Annual International (Virtual) Meeting. July 12 – July 14, 2021. Paper number 2101023

Pickering, A., Aranda, G., Wang, N., Long, J., Weckler, P. 2021. *3D Camera-Based Autonomous Navigation System for Row Crop Production*. presented at the 2021 ASABE Annual International (Virtual) Meeting. July 12 – July 14, 2021. Paper number 2100985

Bussey, L., Weckler, P. (2021). *Investigating Rural Housing - with a focus on Ripley, Oklahoma, and Glencoe, Oklahoma*. 2021 OSU Rural Renewal Symposium. Stillwater, OK.

Young, W., Visina, C., Bachman, B., Moorman, H., Weckler, P. Maness, N., 2021. *Development of a Cedar Foliage Harvester*. presented at the 2021 ASABE Annual International (Virtual) Meeting. July 12 – July 14, 2021. Paper number 2101023

J. S. Robinson, Tyson, E. Ochsner, Paul Weckler, and Mark Woodring, Oklahoma State University. Equipping Students to Address Wicked Problems in Rural Communities: *The Development of a Rural Scholars Program*. Presented at American Association of Agricultural Educators (AAAE) 2020 National AAAE Virtual Conference May 18-21, 2020. [2020 AAAE Virtual Conference \(Innovative Idea Poster\)](#).

Meek, A., Muller, L., Ochsner, T. E., Weckler, P. (2020). *Wireless soil moistures sensor performance in irrigated cropland: On-farm evaluation*. 2020 OSU Rural Renewal Symposium.

Muller, L., Meek, A., Weckler, P., Sibley, M., & Ochsner, T. E. (2020). *Use of soil moisture information in agricultural decision-making perspectives from irrigators*. 2020 OSU Rural Renewal Symposium.

Coats, B., & Burns, A., Weckler, P. (2020). *Evaluating rural restoration potential and the problems rural communities face in infrastructure maintenance/revitalization*. 2020 OSU Rural Renewal Symposium.

Zhai, C., Bai, H., Long, J., Wang, N., Weckler, P. and Taylor, R., 2020. *Impacts of Precision Planted and Oriented Corn Seed: A Field Study*. presented at the 2020 ASABE Annual International (Virtual) Meeting. July 13 – July 15, 2020. Paper number 2001501

Weckler, P., *What is Biosystems & Agricultural Engineering?* OSSEF Teacher Workshop. Oklahoma State Science and Engineering Fair (OSSEF) OSU-Tulsa, Tulsa Oklahoma Saturday October 12, 2019

Weckler, P., et al., *Development of a tethered UAV sprayer*. presented at the 2018 ASABE Annual International Meeting. July 7 – July 10, 2019. Boston, Massachusetts. Paper number 1901548

Weckler, P., et al., *Development of a Practical Cold Plasma Food Sanitation Processing System*. presented at the 2018 ASABE Annual International Meeting. July 7 – July 10, 2019. Boston, Massachusetts. Paper number 1901548

L. Zhang, C. Xia, D. Xiao, P. Weckler, Y. Lan and J. Lee, *A Leaf Vein Detection Scheme For Locating Individual Plant Leaves*, presented at the 2018 International Conference on Information and Communication Technology Robotics (ICT-ROBOT), held September 6-8, 2018 in Busan, Korea. doi: 10.1109/ICT-ROBOT.2018.8549901

Weckler, P., et al., *Field Evaluation of Commerical "on-the-go" Soil Sensors*. presented at the 2018 ASABE Annual International Meeting. July 29 – Aug. 1, 2018. Detroit, Michigan. Paper number 1801663

Weckler, P., *Interdisciplinary Capstone Senior Design--the Good, Bad & the Ugly!* presented at the 2018 ASABE Annual International Meeting. July 29 – Aug. 1, 2018. Detroit, Michigan. Paper number 1801678

Weckler, P., et al., *Teaching In-Vehicle Networking for Off-Road and Heavy Duty Systems.* presented at the 2018 ASABE Annual International Meeting. July 29 – Aug. 1, 2018. Detroit, Michigan. Paper number 1801665

Rogers, M.B., C.C. Craige, K.G. Moore, J.M. Long, P. Weckler. *Sprayer Evaluation on Tall Pecan Trees.* presented at the 2016 ASABE Annual International Meeting. July 17 – 20, 2016. Orlando, Florida. Paper number 162460314.

Zhai, C., J.M. Long, P. Weckler, N. Wang, R. Taylor. *Investigating Planter Row Unit Ride Quality Thresholds.* presented at the 2016 ASABE Annual International Meeting. July 17 – 20, 2016. Orlando, Florida. Paper number 162461277.

Weckler, P., *Soil Moisture Sensing and Precision Agriculture.* The 2016 Workshop at MOISST: The Growing Science of Soil Moisture Sensing. May 17-18, 2016. Oklahoma State University. Stillwater, OK

Weckler, P., N. Wang, C. Zhai, L. Zhang, B. Luo, J. Long, R. Taylor. *Evaluation of a Seed-Fertilizer Application System Using a Laser Scanner.* A paper from the Proceedings of the 13th International Conference on Precision Agriculture (ICPA) Jul 31, 2016 to Aug 03, 2016. St. Louis, MO.

Morris, C., P. Weckler, B. Arnall, P. Alderman, J. Kidd, A. Sutherland. *Weather Impacts on UAV Flight Availability for Agricultural Purposes in Oklahoma.* A paper from the Proceedings of the 13th International Conference on Precision Agriculture (ICPA) Jul 31, 2016 to Aug 03, 2016. St. Louis, MO.

Weckler, P., *UAVs in Agriculture.* 2016 UAS In-Service for County Educators and Volunteers. April 19, 2016, Stillwater, OK

Weckler, P., *UAS (Drones) Technology of the Future.* The Juntos Educational Outreach Program. July 20, 2016, Stillwater, OK

Yazgi, A., Taylor, R.K., Navid, H., Weckler, P. *Performance Modeling and Seed Releasing Characteristics of a Corn Planter Metering Unit Using Response Surface Methodology.* presented at the 2015 ASABE Annual International Meeting. July 26 – 29, 2015. New Orleans, Louisiana. Paper number 152184161 (doi: 10.13031/aim.20152184161) @2015

Weckler, P., Bowser, T., Willoughby, C., Enns, D., *Capstone Senior Design Projects: Highlighting University-Industry Partnerships.* presented at the 2015 ASABE Annual International Meeting. July 26 – 29, 2015. New Orleans, Louisiana. Paper number 152189335

Weckler, P., Wang, N., Jacob, J., Kidd, J. 2015 *UAVs in Agriculture: Issues and Concerns.* presented at the 2015 ASABE Annual International Meeting. July 26 – 29, 2015. New Orleans, Louisiana. Paper number 152189322

X. Ju, Z. Li, P. Weckler. 2015 *Hydraulic Design of Uniformly Sloping Trickle Laterals Based On Emitter Flow Variation.* presented at the 2015 ASABE Annual International Meeting. July 26 – 29, 2015. New Orleans, Louisiana. Paper number 152136025

Fox, G., P. Weckler, D. Thomas. 2014. **Linking Freshmen and Senior Engineering Design Teams: Engaging Early Academic Career Students in Engineering.** Presented at the 2014 ASABE Annual International Meeting. Montreal, Quebec, Canada, July 13-16, 2014. Paper number 141891819

Franzen, A; N. Wang, P. R. Weckler, 2014. **Temporal Monitoring of Pecan Weevil Emergence With In-Orchard Imaging.** Presented at the 2014 ASABE Annual International Meeting. Montreal, Quebec, Canada, July 13-16, 2014. Paper number 141914127

Wang, N., J. Kidd, R. Taylor, P. Weckler, J. Zhang, F. Keating, Y. Shi, 2014. **Preliminary Field Tests on UAV-based Sensing for Corn Orientation Evaluation.** Presented at the 2014 ASABE Annual International Meeting. Montreal, Quebec, Canada, July 13-16, 2014. Paper number 141913682

Koller, A. A., R. Taylor, P. Weckler, M. Buser, W. Raun, 2013. **Design, Performance Prediction, and Validation of a Seed Orienting Corn Planter.** Presented at the 2013 ASABE Annual International Meeting. Kansas City, Missouri, July 21 - July 24, 2013. Paper number 131620580.

Porter, W. M., Y. Shi, J. A. Rascon, R. K. Taylor, P. Weckler, 2013. **Laboratory Evaluation of a Turn Compensation Control System for a Ground Sprayer**. Presented at the 2013 ASABE Annual International Meeting. Kansas City, Missouri, July 21 - July 24, 2013. Paper number 131562442.

Wan, Y., A. Koller, E. Miller, P.R. Weckler, R.K. Taylor, 2013. **Test Methods for Precision Seed Singulation Systems**. Presented at the 2013 ASABE Annual International Meeting. Kansas City, Missouri, July 21 - July 24, 2013. Paper number 131619471

Taylor, R., Y. Wan, A. Koller, M. Oldham, E. Miller, P.R. Weckler, 2013. **Evaluation of Corn Singulation Meters**. Presented at the 2013 ASABE Annual International Meeting. Kansas City, Missouri, July 21 - July 24, 2013. Paper number 131620912

Hardin, J. A., P. R. Weckler, and C. L. Jones. 2012. Estimation Of Pecan Yield Using Backscattered Terrestrial Microwave Sensing. Presented at the 2012 ASABE Annual International Meeting. Dallas, Texas, July 29 - August 1, 2012. Paper number 121337363

Koller, A. A., J. A. Rascon, E. Lam, M. Metcalf, A. Childers, B. Raun, R. Taylor, P. Weckler, 2012, Design and Development of a Stick Planter for the Developing World. Presented at the 2012 ASABE Annual International Meeting. Dallas, Texas, July 29 - August 1, 2012. Paper number 121336707

Koller, A. A., R. Taylor, B. Raun, P. Weckler, M. Buser, 2012, Angular Seed Orientation Tolerances For A Precision Corn Planter. Presented at the 2012 ASABE Annual International Meeting. Dallas, Texas, July 29 - August 1, 2012. Paper number 121336708

Franzen, A; P. R. Weckler, N. Wang, 2012. Wireless Signal Path Loss And Transmission Success Rates In Orchard Environments. Presented at the 2012 ASABE Annual International Meeting. Dallas, Texas, July 29 - August 1, 2012. Paper number 121336701

Weckler, P. R., T. Bowser, J. Kinder, M. Smith, L. Ma, 2012. Development Of A Low-Cost Small Scale Sanitizer For In-Shell Pecans. Presented at the 2012 ASABE Annual International Meeting. Dallas, Texas, July 29 - August 1, 2012. Paper number 121338348

A. Riggs, K. Smith, C. Blackwell, P. Weckler, D. Tilley, R. Holcomb, S. Sitton, R. Delahoussaye, *The Innovations Senior Design Courses at Oklahoma State University: Lessons Learned*. 2011 ASABE Annual International Meeting. Louisville, Kentucky.

Hardin, J. A., C. L. Jones, N. O. Maness, P. R. Weckler, and J. W. Dillwith. 2011. *Rapid in situ Quantification of Leaf Cuticular Wax Using FTIR-ATR and DSC*. 2011 ASABE Annual International Meeting. Louisville, Kentucky. ASABE Paper number 1111631

Franzen, A., P.R. Weckler, & N. Wang. 2011. *Evaluation of single-insect proximity detection methods for use in ultra-low-power systems*. 2011 ASABE Annual Meeting, August 7-10, 2011, Louisville, Kentucky. ASABE Paper No. 1111838

Samba, A., 2011, *Machine Vision for Non-Destructive Pecan Grading*. Presented at the 2011 ASABE Annual International Meeting. Louisville, Kentucky. Paper No. 1111300

Smith, M.W. and P. Weckler. 2010. *Pecan industry to establish research, extension priorities*. Pecan South 43(10):12-14.

Smith, M.W. and P. Weckler. 2011. *Industry driven pecan research and extension priorities*. Pecan Grower. 22(4):80-83.

Smith, M.W. and P. Weckler. 2011. *Industry meets to pinpoint research, extension priorities*. Pecan South 44(2):14, 15-17,18.

Smith, M.W. and P. Weckler. 2011. *Industry driven pecan research and extension priorities*. Proc. Okla. Pecan Growers' Assn. 81:13-17.

Weckler, P., Riggs, A., Sitton, S., Tilley, D., Holcomb, R., Blackwell, C., Delahoussaye, R., Tilley, M., Cavaletto, R., Zohns, M., Jones, D., & Yianaka, A. *Conflict Resolution on Interdisciplinary Capstone Projects*. Presented the 2010 ASABE Annual International Meeting, June 20-23, 2010, Pittsburgh, Pennsylvania.

S. K Mathanker, P. R. Weckler, R. K. Taylor, G. Fan. *Adaboost and Support Vector Machine Classifiers for Automatic Weed Control: Canola and Wheat*. Presented the 2010 ASABE Annual International Meeting, June 20-23, 2010, Pittsburgh, Pennsylvania. Paper number 1008834,

J. Duvall, P. Weckler, C. Bunting, *Electromagnetic Analysis of Soil Moisture via Reflection Characteristics*. Presented the 2010 ASABE Annual International Meeting, June 20-23, 2010, Pittsburgh, Pennsylvania.

Franzen, A., P.R. Weckler, & N. Wang. 2010. *Automated In-Orchard Imaging of Pecan Weevils for Insect Recognition*. Presented at the 2010 ASABE Annual Meeting, June 20-23, 2010, Pittsburgh, Pennsylvania. Paper No. 1009637.

Riggs A., Smith, K., Blackwell, C., Weckler, P., Tilley, D., Holcomb, R., Sitton, S., & Ron Delahoussaye. (2010). *Benchmarking the Innovations Capstone Course at Oklahoma State University: Lessons learned and changes made*. Presented at the ASABE Midwest Section 45th Annual Meeting, Lawrence, KS.

Tilley, D., Weckler, P., Blackwell, C., Holcomb, R., Sitton, S., Riggs, A., Delahoussaye, R., Tilley, M., Cavaletto, R., Zohns, M., Howard, W., & Jones, D. (2010). *Collaboration and Communication Create Innovation Celebrations*. Session presentation at the annual meeting of the North American Colleges and Teachers of Agriculture (NACTA), State College, PA.

Mathanker, S. K., P. R. Weckler, T. Bowser, N. Wang, N. O. Maness, G. Fan, and M. Stone. 2010. *Local adaptive thresholding and AdaBoost classifier for pecan defect identification*: ASABE Oklahoma Section meeting, Stillwater, OK: ASABE Oklahoma Section.

Mathanker, S. K., P. R. Weckler, T. Bowser, N. Wang, N. O. Maness, G. Fan, and M. Stone. 2010. *Automated x-ray imaging based defect detection in pecans*. The 21st OSU Annual Research Symposium, Stillwater, OK: Oklahoma State University.

Mathanker, S. K., P. R. Weckler, T. Bowser, N. Wang, N. O. Maness, G. Fan, and M. Stone. 2010. *Local adaptive thresholding and AdaBoost classifier for automated x-ray imaging system for pecan defect detection*. FAPC/IFT-OK Research Symposium, Stillwater, OK: Food and Agricultural Products Center, Oklahoma State University.

Franzen, A., P.R. Weckler, N. Wang, & N. Maness. 2010. *Development of Wireless Sensor Network for Pecan Monitoring Weevil Emergence*. The International Symposium on Wireless Sensor Network in Agriculture (ISWSNA2010), November 18-21, 2010, Beijing, China.

High Plains Journal article. Dec. 10, 2010

<http://www.hpij.com/archives/2010/dec10/dec13/1104PecanInputSoughtko.cfm?title=Pecan%20industry%20input,%20scientific%20collaboration%20sought%20for%20February%20research%20meeting>

Southwest Farm Press, Nov. 4, 2010.

<http://southwestfarmpress.com/orchard-crops/pecan-industry-input-sought-february-meeting>

S.K. Mathanker, P.R. Weckler, N. Wang, T. Bowser, N.O. Maness, Adaptive Thresholding of Pecan X-ray Images using Water Flow Models and Feature Extraction. Presented at the 2009 ASABE Annual Int'l Meeting, Reno, Nevada, June 21 - June 24, 2009. Paper number 096052

A. Franzen, P.R. Weckler, N. Wang,, A Wireless Camera Network Prototype for Pecan Weevil Identification. Presented at the 2009 ASABE Annual Int'l Meeting, Reno, Nevada, June 21 - June 24, 2009.

Tilley, D., Tilley, M., Jones, D., Sitton, S., Blackwell, C., Holcomb, R., Weckler, P., Riggs, A., Cavaletto, R., Howard, W., Zohns, M., & Yiannaka, A., *Assessing outcomes from multidisciplinary capstone/senior design classes*. Presented at the annual meeting of the North American Colleges and Teachers of Agriculture (NACTA), Stillwater, OK. (2009).

A. Sharma, G. Dilawari, R. Taylor, P. Weckler, J. C. Banks, S. Osborne, On-the-Go Sensor System for Cotton Management. Presented at the 2008 ASABE Annual Int'l Meeting, Providence, RI, June 29–July 2, 2008. Paper number 084279

S. Mathanker, P. Weckler, R. Taylor, Canola–Weed Identification for Machine Vision based Patch Spraying. Presented at the 2008 ASABE Annual Int'l Meeting, Providence, RI, June 29–July 2, 2008. Paper number 085134

F. Ding, C. L. Jones, P. R. Weckler, Detection and Identification of Stored Grain Insects with RF/Microwave and Neural Network Technology Presented at the 2008 ASABE Annual Int'l Meeting, Providence, RI, June 29–July 2, 2008. Paper number 082343

P. Weckler, D. Tilley, S. Sitton, R. Holcomb, C. Blackwell, R. Delahoussaye, R. Cavaletto, M. Zohns, M. Tilley, W. Howard, D. Jones, A. Yiannaka, A True Interdisciplinary Capstone Senior Design Experience, Presented at the 2008 ASABE Annual Int'l Meeting, Providence, RI, June 29–July 2, 2008. Paper number 084196

A. Franzen, P. Weckler, S. Ashaghathra, J. Solie, M. Stone, A. Wayadande, A Novel Pecan Weevil Monitoring System, presented at the 78th Annual Convention, Oklahoma Pecan Growers Association, June 29-July 1, 2008

M. Tilley, D. Tilley, A. Yiannaka, R. Holcomb, W. Howard, P. Weckler, Teaching Innovation as Part of an Agribusiness Curriculum, Selected Paper presented at the American Agricultural Economics Association Annual Meeting, Orlando, FL, July 27-29, 2008

- Saleh Ashaghathra & Paul Weckler. Identification of pecan weevils through image processing. Saudi International Innovation Conference 2008, Leeds University 09-10 June
- P. Weckler, R. Delahoussaye, D. Jones R. Cavaletto, M. Zohns, Interdisciplinary Innovation Education to Solve Real Business and Design Problems, Presented at the 115th Annual ASCE Conference & Exposition, Pittsburgh, PA, June 22–25, 2008. AC 2008-1181
- Sitton, S., Tilley, D., Weckler, P., Holcomb, R., Blackwell, C., Delahoussaye, R., Tilley, M., Howard, W., Cavaletto, R., Zohns, M., Jones, D., & Yiannaka, A. Retaining the best by creating workplace-ready graduates through interdisciplinary senior capstone innovation projects, Poster presented at the 54th annual conference of the North American Colleges and Teachers of Agriculture, Logan, UT. June 2008
- P. Weckler, S. Ashaghathra, J. Solie, M. Stone, A. Wayadande, Identifying Pecan Weevils through Image Processing Techniques, Presented at the 68th Annual Meeting Southern Region of the American Society for Horticultural Science Dallas, TX, Feb. 2-4, 2008
- A. Sharma, G. Dilawari, S. Osborne, J. C. Banks, R. Taylor, P. Weckler, On-the-Go Sensor System for Cotton Management, Presented at the 2008 Beltwide Cotton Conferences, January 8-11, 2008, Nashville, TN
- S. Mathanker, P. Weckler, R. Taylor, Effective Spatial Resolution for Weed Detection, Presented at the 2007 ASABE Annual Int'l Meeting, Minneapolis, MN, 17-20 June 2007. Paper Number: 073049
- S. Ashaghathra, P. Weckler, J. Solie, M. Stone, A. Wayadande, Identifying Pecan Weevils through Image Processing Techniques Based on Template Matching, Presented at the 2007 ASABE Annual Int'l Meeting, Minneapolis, MN, 17-20 June 2007. Paper Number: 073045
- R. A. Ward, P. R. Weckler, G. O. Brown, D. M. Temple, F. D. Shields, Jr., C. V. Alonso, Design of Large Wood Structures in Sand-bed Streams, Presented at the 2007 ASABE Annual Int'l Meeting, Minneapolis, MN, 17-20 June 2007. Paper Number: 072241
- Ward, R.A., Brown, G.O., Weckler, P.R., Temple, D.M., Shields Jr, F.D., Alonso, C.V., Modeling Large Wood Structures in Sand-bed Streams. Proceedings of the World Water and Environmental Resources Congress, 2007, American Society of Civil Engineers. CD-ROM 2007.
- S. Ashaghathra, P. Weckler, A New Algorithm for Identifying Pecan Weevils through Image Processing Techniques, Presented at the IEEE Applied Imagery Pattern Recognition (AIPR-2007) Workshop held October 10-12, 2007, Washington, D.C.
- C.P. Shah, P.R. Weckler, N. O. Maness, Detection of Pecan Weevil Larvae in Pecan Nutmeat using Multispectral Imaging, presented at the 2006 ASABE Annual Int'l Meeting, Portland, OR, July 9-12 2006. Paper #: 063077
- R. A. Ward, P. R. Weckler, G. O. Brown, D. M. Temple, F. D. Shields, Jr., C. V. Alonso, Design of Large Wood Structures in Sand-bed Streams, presented at the Oklahoma Water 2006 Symposium, Oklahoma City, OK, Oct. 5-6, 2006. First place poster presentation.
- P.R. Weckler, R. Jayasekara, M.L. Stone, Calibration and Use of Multispectral Cameras, presented at the 2005 ASAE Annual Int'l Meeting, July 2005, Tampa, Florida, Invited Paper
- J. Subbiah, P.R. Weckler, Calibration and Use of X-ray Imaging, presented at the 2005 ASAE Annual Int'l Meeting, July 2005, Tampa, Florida, Invited Paper
- D.L. Needham, P.R. Weckler, C.F. Bunting, M.L. Stone, Non-Contact Prediction of Soil Moisture Profiles using Radio Wave Reflection, presented at the 2005 ASAE Annual Int'l Meeting, July 2005, Tampa, Florida, Paper #: 051034 (future journal article)
- R. Vishwanathan, P.R. Weckler, J.B Solie, M.L. Stone, Evaluation of GPS and Radar Ground Speed Measurements Under Varying Vegetative Conditions, presented at the 2005 ASAE Annual Int'l Meeting, July 2005, Tampa, Florida, Paper #: 051087 (future journal article)
- M. Haungs, B. Cannon, R. Strohmman, and P. Weckler, Rapid Delivery of Massive Geospatial Data over Internet2, Fall 2004 Internet2 Member Meeting, September 27-30, 2004, Austin, Texas.
- P. Weckler, C. Jones, R. Jayasekara, M. Stone, N. Maness, Estimating Water Stress in Greenhouse Grown Plants Using Hyperspectral Sensing, presented at the 2004 ASAE/CSAE Annual Int'l Meeting, Aug. 2004, Ottawa, Ontario, Canada. Paper #: 043065 (future journal article)

H. Bangera, P.R. Weckler, T.J. Bowser, and N.O. Maness, *Design of a Watermelon Pulp Fruit and Juice Extraction Machine*, presented at the 2004 ASAE/CSAE Annual Int'l Meeting, Aug. 2004, Ottawa, Ontario, Canada. Paper #: 041026

B.R. Rao, P.R. Weckler, and T.J. Bowser, *Gasification of Food and Agricultural Processing Byproducts -An Economic Waste Handling Alternative*, presented at the 2004 ASAE/CSAE Annual Int'l Meeting, Aug. 2004, Ottawa, Ontario, Canada. Paper #: 046143

R. Choudhary, T.J. Bowser, N.O. Maness, W. McGlynn, P. Weckler and M. L. Stone, *Estimation of Lycopene Concentration in Watermelon and Tomato Puree by Visual Reflectance Spectroscopy*, presented at the 2004 ASAE/CSAE Annual Int'l Meeting, Aug. 2004, Ottawa, Ontario, Canada. Paper #: 046119

H. Bangera, P.R. Weckler, T.J. Bowser, and N.O. Maness, *Design of a Watermelon Pulp Fruit and Juice Extraction Machine*, presented at the Third Annual Food Science Research Symposium, Oklahoma Food & Ag Products Research & Technology Center, Stillwater, OK April 19, 2004.

S. Jeyamkondan, G.A. Kranzler, B. Morgan, P.R. Weckler, T.J. Bowser, *Non-destructive Methods for Predicting Beef Tenderness*, presented at the Third Annual Food Science Research Symposium, Oklahoma Food & Ag Products Research & Technology Center, Stillwater, OK April 19, 2004.

B.R. Rao, P.R. Weckler, and T.J. Bowser, *Gasification of Food Processing Byproducts – An Economic Waste Handling Technique*, presented at the Third Annual Food Science Research Symposium, Oklahoma Food & Ag Products Research & Technology Center, Stillwater, OK April 19, 2004.

R. Choudhary, T.J. Bowser, N.O. Maness, W. McGlynn, P. Weckler and M. L. Stone, *Rapid Sensing of Lycopene in Watermelon and Tomatoes Using Visible Spectroscopy*, presented at the Third Annual Food Science Research Symposium, Oklahoma Food & Ag Products Research & Technology Center, Stillwater, OK April 19, 2004.

P.R. Weckler, M.L. Stone, N.O. Maness, R.S. Jayasekara, C.L. Jones, T. Kersten, D. Chrz, *Remote Sensing to Estimate Chlorophyll Concentration Using Multi-Spectral Plant Reflectance Sensing*, presented at the 2003 ASAE Annual Int'l Meeting, July 27-30, 2003, Las Vegas, NV.

P.R. Weckler, T.J. Bowser, K.N. Patil, and C. DeWitt, *Design and Testing of a Low-Cost, Pilot-Scale Batch Gasifier for Food Processing Byproducts*, presented at the 2003 ASAE Annual Int'l Meeting, July 27-30, 2003, Las Vegas, NV.

C.L. Jones, P.R. Weckler, T.J. Bowser and K.N. Patil, *Feasibility of Steam Generation from Gasified Pork-Processing Byproducts*, presented at the 2003 ASAE Annual Int'l Meeting, July 27-30, 2003, Las Vegas, NV.

N. Kotwaliwale, G.H. Brusewitz, P.R. Weckler, *Physical Characteristics of Pecan Components: Effect of Cultivar and Moisture Content*, presented at the 2003 ASAE Annual Int'l Meeting, July 27-30, 2003, Las Vegas, NV.

S. Jeyamkondan, G.A. Kranzler, N. Kotwaliwale, and P. Weckler, *Predicting Beef Tenderness Using Dual-Energy X-ray Attenuation*, presented at the 2003 ASAE Annual Int'l Meeting, July 27-30, 2003, Las Vegas, NV.

N. Kotwaliwale, P.R. Weckler, G.H. Brusewitz, *Digital Radiography for Quality Determination of Small Agricultural Products: Development and Calibration of Equipment*, presented at the 2003 ASAE Annual Int'l Meeting, July 27-30, 2003, Las Vegas, NV.

S. Jeyamkondan, G.A. Kranzler, N. Kotwaliwale, and P. Weckler, *Predicting Beef Tenderness Using Dual-Energy X-ray Attenuation*, presented at the IFT Annual Meeting, July 2003, - Chicago, IL.

P. Weckler, S. Harp, *Development of a Hydraulic Controller for a Bermuda Sprig Planter*, presented to Oklahoma State Legislature Senate staffers, Stillwater, OK, Oct. 2002.

T.J. Bowser, P. R. Weckler, R. Jayasekara, *Process Design and Operation of a Steam Injection Heater for Viscous Food and Agricultural Products*, Presented at the Second Annual Food Science Research Symposium, Oklahoma Food & Ag Products Research & Technology Center, Stillwater, OK, April 2002.

P.R. Weckler, R. Jayasekara, J.B. Solie, M.L. Stone, C.N. Washmon, *Airborne Collection of NDVI Data on Winter Wheat in Oklahoma*, presented at the 2002 ASAE/CIGR Annual Int'l Meeting, July 28-31, 2002 – Chicago, IL.

T.J. Bowser, P.R. Weckler, R. Jayasekara, 2002 *Process Design and Operation of a Steam Injection Heater for Viscous Food and Agricultural Products*, presented at the 2002 ASAE/CIGR Annual Int'l Meeting, July 28-31, 2002 – Chicago, IL.

Prior to OSU - Publications and Papers

The 21st Century Classroom, Joe Glass & Paul Weckler, ASAE Resource Magazine, November 1999 - Vol. 6 No. 11.

"Using Visual Basic in Excel to Teach Food Engineering Heat Transfer" presented at the 1998 ASAE Annual International Meeting, July 12-15, 1998, Orlando, Florida.

"Airborne Test & Measurement Support (ATMS) Contract Proposal," submitted to the U.S. Army Space and Strategic Defense Command, Huntsville, AL, 1995 **(Winning \$25 million contract proposal).**

"Infrared Instrumentation System (IRIS) Sustaining, Operations & Maintenance (IMSOM) Contract Proposal," submitted to the U.S. Army Space and Strategic Defense Command, Huntsville, AL, 1995.

"HALO Red Tigress II Final Report," submitted to the Ballistic Missile Defense Organization, The Pentagon, Washington DC, 1994.

"HALO/IRIS Post-Mission Report For STC-3 BTTV-7," submitted to the U.S. Army Space and Strategic Defense Command, Huntsville, AL, 1994.

"Optical Sightline Characterization," Small Business Innovative Research (SBIR) proposal, Principle Investigator, submitted to the U.S. Army, 1993.

"HALO/IRIS Flight Experiment #3 (FE-3) Final Report," submitted to the Ballistic Missile Defense Organization, The Pentagon, Washington DC, 1993.

"HALO/IRIS Countermeasures Demonstration Experiment (CDX) Final Report," submitted to the Ballistic Missile Defense Organization, The Pentagon, Washington DC, 1993.

"HALO Image Processing Laboratory-Phase III, Statement of Work," submitted to the U.S. Army Space and Strategic Defense Command, Huntsville, AL, 1992.

"Final Report For Dedicated Target #1 (DT-1)," submitted to the U.S. Army Strategic Defense Command, Huntsville, AL, 1991.

"Assessment of Cloud Effects on High ALTitude Observatory (HALO) Aircraft Operation," presented at the 1991 Cloud Impacts on DOD Operations and Systems Conference, Aerospace Corp., El Segundo, California, July 1991.

"High ALTitude Observatory (HALO) Aircraft Capabilities," presented at the NASA Fourth Airborne Geoscience Workshop, La Jolla, California, January 29 - February 1, 1991.

"Optical Range-finding Using the Walsh Transform," presented at the ASAE Summer Meeting, Columbus, Ohio, June 1990.

"Optical Range-finding from Image Focus," Paper Number 1260-02, presented at the 1990 SPIE/SPSE Symposium on Electronic Imaging Science and Technology, Santa Clara, California, February 1990.

"Optical Range-finding from Image Focus," Paper Number 89-7060, presented at the ASAE Summer Meeting, Quebec, Canada, June 1989.

"Fabrication Problems with In Vivo Microelectronic Agricultural Sensors," presented at the ASAE Pacific Regional Meeting, Sacramento, California, January 1985.

"Cutback Irrigation with Automated Surge Flow Techniques," Paper Number 84-2090, presented at the ASAE Summer Meeting, Knoxville, Tennessee, June 1984.

"Runoff Rates Under Surge Flow Irrigation," presented at the ASAE Rocky Mountain Regional Meeting, Albuquerque, New Mexico, April 1984.

Numerous Other Proprietary and/or Classified Reports and Presentations to DoD and NASA Customers Between 1990 and 1997.

Graduate Thesis Advisor or Committee Chair

9 -- Ph.D. candidates	<i>Total since Assoc. Prof.</i> 8
9 -- M.S. candidates	<i>Total since Assoc. Prof.</i> 4

Graduate Committee Member

20 -- Ph.D. candidates	<i>Total since Assoc. Prof.</i> 12
27 -- M.S. candidates	<i>Total since Assoc. Prof.</i> 18

GRADUATE THESIS ADVISOR

Josh Phillips M.S. Candidate, Biosystems & Agricultural Engineering Committee Chair & Thesis Advisor: Dr. Paul Weckler	completed Fall 2021
Nelly Ruiz Ph.D. Candidate, Biosystems & Agricultural Engineering Committee Chair & Thesis Advisor: Dr. Paul Weckler	Completed Spring 2019
Abdoulaye Samba M.S. Candidate, Biosystems Engineering Committee Chair & Thesis Advisor: Dr. Paul Weckler	
Aaron Franzen Ph.D. Candidate, Biosystems Engineering Committee Chair & Thesis Advisor: Dr. Paul Weckler	Completed Fall 2016
Adrian Koller Ph.D., Biosystems Engineering Committee co-Chair & Dissertation co-Advisor: Dr. Paul Weckler	Completed Spring 2013
James Hardin Ph.D., Biosystems Engineering Committee co-Chair & Dissertation co-Advisor: Dr. Paul Weckler	Completed Spring 2012
Sunil Mathanker Ph.D., Biosystems Engineering Dissertation Advisor: Dr. Paul Weckler	Completed Fall 2010
Amit Sharma M.S., Biosystems Engineering Committee Chair & Thesis Advisor: Dr. Paul Weckler Masters Thesis: <u><i>On-the-go sensor technology for cotton management</i></u>	Completed Spring 2009
Saleh Ashaghathra Ph.D., Biosystems Engineering Committee Chair: Dr. John Solie Doctoral Dissertation: <u><i>Identifying Pecan Weevils through Image Processing Techniques</i></u>	Completed Summer 2008
Chaital Shah M.S., Biosystems Engineering Committee Chair & Thesis Advisor: Dr. Paul Weckler Masters Thesis: <u><i>Detection of Pecan Weevil Larvae in Pecan Nutmeat using Multispectral Imaging System</i></u>	Completed Summer 2006
Roshani Jayasekara Ph.D., Biosystems Engineering	Completed Spring 2006

Committee Chair: Dr. John Solie

Dissertation: Design and Validation for Laser Based Scanning Reflectometer

Ramesh Vishwanathan

Completed Summer 2005

M.S., Biosystems Engineering

Committee Chair & Thesis Advisor: Dr. Paul Weckler

Masters Thesis: Evaluation of ground speed sensing devices under varying ground surface conditions.

Harish Banger

Completed Spring 2005

M.S., Biosystems Engineering

Committee Chair & Thesis Advisor: Dr. Paul Weckler

Masters Thesis: Investigation of a watermelon pulp fruit and juice extraction device.

Bhaskar Rao

Completed Fall 2004

M.S., Biosystems Engineering

Committee Chair: Dr. Tim Bowser

Masters Thesis: Gasification of food processing byproducts - an economic waste handling alternative.

Ruplal Choudhary

Completed Fall 2004

Ph.D., Biosystems Engineering

Committee Chair: Dr. Tim Bowser

Doctoral Dissertation: Rapid estimation of lycopene concentration in watermelon and tomato samples by fiber optic visible spectroscopy.

Duane Needham

Completed Summer 2003

Ph.D., Biosystems Engineering

Committee Chair: Dr. Marvin Stone

Doctoral Dissertation: Non-contact prediction of soil moisture profiles using radio wave reflection.

GRADUATE COMMITTEE MEMBER

Jaymee Zabienski

M.S., Biosystems Engineering

Advisor: Dr. Tim Bowser

Calvin Wynn

M.S., Biosystems Engineering

Advisor: Dr. Tim Bowser

Ethan Abele

Ph.D., Electrical & Computer Engineering

Advisor: Dr. John O'hara

Peyman Nematzadeh

completed Summer 2022

Ph.D., Biosystems Engineering

Advisor: Dr. Ning Wang

Austin Pickering

completed Spring 2022

M.S., Biosystems Engineering

Advisor: Dr. Ning Wang

Wade Young

completed Spring 2022

M.S., Biosystems Engineering

Advisor: Dr. Ning Wang

Elizabeth Eickhoff Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Spring 2021
Mukesh Mehata Ph.D. Candidate, Biosystems & Ag Engineering Advisor: Dr. Saleh Taghvaeian	completed tbd
Lawrence Aula Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Fall 2020
Fikayo Oyebiyi Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Fall 2020
Peter Omara Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Fall 2020
Bruno Figueiredo Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed tbd
Eva Nambi Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Spring 2021
Ali Ajaz Ph.D. Candidate, Biosystems & Agricultural Engineering Advisor: Dr. Saleh Taghvaeian	completed Summer 2020
Gwen Wehmeyer Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Spring 2020
Sumon Datta Ph.D. Candidate, Biosystems & Agricultural Engineering Advisor: Dr. Saleh Taghvaeian	completed spring 2020
Kul Khand Ph.D. Candidate, Biosystems & Agricultural Engineering Advisor: Dr. Saleh Taghvaeian	completed Spring 2019
Saif Alharbi Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Spring 2018
Spencer Corry M.S. Candidate, Biosystems & Agricultural Engineering Advisor: Dr. Tim Bowser	completed Fall 2018
Jagman Dhillon Ph.D. Candidate, Plant & Soil Science Advisor: Dr. Bill Raun	completed Fall 2019
Alimamy Fornah Ph.D. Candidate, Plant & Soil Science	completed Fall 2018

Advisor: Dr. Bill Raun

Bob Mackey
Ph.D. Candidate, Biosystems & Agricultural Engineering
Advisor: Dr. Tim Bowser
completed Spring 2018

Abigail Parnell
M.S. Candidate, Biosystems & Agricultural Engineering
Advisor: Dr. Dan Storm, Committee Chair Dr. Paul Weckler
completed Summer 2018

Praveen Yerramsetti
Ph.D. Candidate, Food Science
Advisor: Dr. Tim Bowser
completed Fall 2018

Adrian Saenz
M.S. Candidate, Biosystems & Agricultural Engineering
Advisor: Dr. Dan Storm, Committee Chair Dr. Paul Weckler
completed Fall 2018

Adam Galadima
M.S. Candidate, International Agriculture
Advisor: Dr. Shida Henneberry
completed Spring 2014

Matt Rogers
M.S. Candidate, Biosystems & Agricultural Engineering
Advisor: Dr. John Long
completed Summer 2017

Jeffrey Callicoa
Ph.D. Candidate, Mechanical & Aerospace Engineering
Advisor: Dr. Jamey Jacob
Completed Spring 2016

Cameron Musgrove
Ph.D., Electrical & Computer Engineering
Advisor: Dr. Jim West
Completed Summer 2015

Ponlakit Jariyatantwait
Ph.D., Electrical & Computer Engineering
Advisor: Dr. Chuck Bunting
Completed Summer 2015

Eric Lam
M.S., Environmental Engineering
Advisor: Dr. Greg Wilber
Completed Summer 2014

Yeyin Shi
Ph.D., Biosystems Engineering
Advisor: Dr. Ning Wang
Completed Spring 2014

Yongbo Wan
Ph.D., Biosystems Engineering
Advisor: Dr. Ning Wang
Completed Summer 2013

Talal AL Khanfous
M.S., International Agriculture
Advisor: Dr. Harry Field
Completed Summer 2013

Amit Khanchi
Ph.D., Biosystems Engineering
Advisor: Dr. Carol Jones
Completed Spring 2012

Grace Okifor
Ph.D., Biosystems Engineering
Advisor: Dr. Carol Jones
Completed Spring 2012

William Roberson
Completed Spring 2011

M.S., Agricultural Economics Advisor: Dr. Dan Tilley	
Celso Tamwle M.S., Biosystems Engineering Advisor: Dr. Glenn Brown	Completed Summer 2011
James Kidd Ph.D., Mechanical & Aerospace Engineering Advisor: Dr. Andy Arena	Completed Summer 2011
Xiaoxue Li Ph.D., Biosystems Engineering Advisor: Dr. John Solie	Completed Spring 2011
Sarah Rowland M.S., Biosystems Engineering Advisor: Dr. Danni Bellmer	Completed Summer 2010
James Duvall M.S., Electrical & Computer Engineering Advisor: Dr. Chuck Bunting	Completed Fall 2010
Wade Svetgoff M.S., Agricultural Economics Advisor: Dr. Rodney Holcomb	Completed Fall 2009
Praveen Bennur M.S., Biosystems Engineering Advisor: Dr. Randy Taylor	Completed Summer 2009
Zhen Li M.S., Biosystems Engineering Advisor: Dr. Ning Wang	Completed Summer 2009
Clint Cosgrove M.S., Biosystems Engineering Advisor: Dr. Ray Huhnke	Completed Spring 2009
Josh Grundman M.S., Biosystems Engineering Advisor: Dr. Carol Jones	Completed Spring 2009
Dean Monroe Ph.D., Environmental Science Advisor: Dr. John Solie	Completed Fall 2008
Rebecca Ward M.S., Biosystems Engineering Advisor: Dr. Glenn Brown	Completed Summer 2007
Joe Dvorak M.S., Biosystems Engineering Advisor: Dr. Marvin Stone	Completed Fall 2007
Becky Ostermann M.S., Biosystems Engineering Advisor: Dr. Tim Bowser	Completed Fall 2005
Eui-Yeol Hong Ph.D., Mechanical & Aerospace Engineering Advisor: Dr. Young Chang	Completed Spring 2005
Jeyamkondan Subbiah Ph.D., Biosystems Engineering Advisor: Dr. Glenn Kranzler	Completed Summer 2004

Amensisa Gelalecha M.S., Electrical & Computer Engineering Advisor: Dr. Charles Bunting	Completed Summer 2004
Saleh Ashaghathra M.S., Biosystems Engineering Advisor: Dr. John Solie	Completed Fall 2003
Nachiket Kotwaliwale Ph.D., Biosystems Engineering Advisor: Dr. Gerald Brusewitz	Completed Summer 2003
Stuart Reed M.S., Biosystems Engineering Advisor: Dr. Marvin Stone	Completed Spring 2003
Anand Lakshmikanth M.S., Biosystems Engineering Advisor: Dr. Glenn Kranzler	Completed Fall 2002
Theodore Kersten M.S., Biosystems Engineering Advisor: Dr. Marvin Stone	Completed Summer 2002
Joey Kovar M.S., Biosystems Engineering Advisor: Dr. Tim Bowser	Completed Summer 2014
Kyle Vandale M.S., Biosystems Engineering Advisor: Dr. Marvin Stone	Completed Summer 2002

UNDERGRADUATE RESEARCH ACTIVITIES

Special Undergrad Research Funding

2021-2022 CEAT Freshman Research Scholar

TITLE: *Wetland Rehabilitation: Plant life*

Elizabeth Casey, BAE undergrad student

Faculty Mentor: Paul Weckler

2020-2021 Wentz Research Scholarship

Total \$5000

TITLE: *Investigation of roughing filter parameters for pretreatment of biosand filter influent*

Alissa Meek, undergrad student

Faculty Mentor: Paul Weckler

2017-2018 CASNR Undergrad Research Grant

Total \$1000

TITLE: *Investigation of roughing filter parameters for pretreatment of biosand filter influent*

Alissa Meek, undergrad student

Faculty Mentor: Paul Weckler

2016-2017 Wentz Research Grant

Total \$5000

TITLE: *Applying Economical Multistep Mass Water Treatment Technologies in Developing Nations*

Josh Seaberg, undergrad student

Faculty Mentor: Paul Weckler

2015-2016 CASNR/OAES Grant -- Undergraduate Research Scholar

Total \$1000

TITLE: *Weather Impacts on UAV Flight Availability for Agricultural Purposes in Oklahoma*

Cooper Morris, undergrad student

Faculty Mentor: Paul Weckler

2015-2016 Wentz Research Grant

Total \$5000

TITLE: *Disinfection of Mass Quantities of Water for Developing Nations*

Josh Seaberg, undergrad student

Faculty Mentor: Paul Weckler

2014-2015 CEAT Freshman Research Scholar

Total \$1000

TITLE: *Comparing Water Filter Effectiveness -- How effective are different types of water filters at removing bacteria?*

Callie Carpenter, undergrad student

Faculty Mentor: Paul Weckler

OSU Rural Scholars program:

The OSU Rural Scholars program aims to benefit both rural communities and Oklahoma State University students. Each summer, OSU students conduct research on the leading issues and grand challenges facing rural communities in Oklahoma and beyond, receiving firsthand research and service experience.

For 10 weeks in the summer, pairs of students live in a rural community and work with community leaders to carry out research projects and provide assistance, support and solutions for community issues. Before that, students are trained through a 16-week, 3-credit hour class, in community-based research approaches and gather background information on their assigned community.

- In summer 2020, Dr. Weckler was the research mentor for the two Rural Scholars that lived in Hollis, OK and worked on infrastructure maintenance/revitalization issues.
- In summer 2021, Dr. Weckler was the research mentor for a Rural Scholar, Lauren Bussey, who worked on housing availability and rehabilitation issues in Ripley and Glencoe, Oklahoma
- In summer 2022, Dr. Weckler was the research mentor for a Rural Scholar, Dorian Cathey, who worked on sustainable agriculture and energy systems in Tillman County, Oklahoma

Presentations by Undergraduate Scholars

Cathey, D., Weckler, P. (2022). *Sustainable Agriculture and Energy Systems for Rural Communities*. 2022 OSU Rural Renewal Symposium, Stillwater, OK, October 2022.

Bussey, L., Weckler, P. (2021). *Investigating Rural Housing - with a focus on Ripley, Oklahoma, and Glencoe, Oklahoma*. 2021 OSU Rural Renewal Symposium. Stillwater, OK.

Ochsner, T., Meek A., Muller L., Weckler P., Datta S., Taghvaeian S., Sibley M., and Ritchie L. (2020) *Use of Soil Moisture Data in Agricultural Water Management: On-farm Sensor Research and Perspectives from Irrigators*. presented at the American Geophysical Union (AGU) 2020 Fall (Virtual) Meeting. Dec 10, 2020.

Young, W., Visina, C., Bachman, B., Moorman, H., Weckler, P. Maness, N., 2021. *Development of a Cedar Foliage Harvester*. presented at the 2021 ASABE Annual International (Virtual) Meeting. July 12 – July 14, 2021. Paper number 2101023

Meek, A., Muller, L., Ochsner, T. E., Weckler, P. (2020). *Wireless soil moistures sensor performance in irrigated cropland: On-farm evaluation*. 2020 OSU Rural Renewal Symposium.

Muller, L., Meek, A., Weckler, P., Sibley, M., & Ochsner, T. E. (2020). *Use of soil moisture information in agricultural decision-making perspectives from irrigators*. 2020 OSU Rural Renewal Symposium.

Coats, B., & Burns, A., Weckler, P. (2020). *Evaluating rural restoration potential and the problems rural communities face in infrastructure maintenance/revitalization*. 2020 OSU Rural Renewal Symposium.

Seaberg, J., P. Weckler, G. Wilber, 2017. *Economically viable and locally generated semibatch disinfection and filtration of drinking water for use in developing nations*. 2017 International WaTER Conference. Univ. of Oklahoma. Sep 18-20, 2017. Norman, OK.

Rogers, M.B., C.C. Craige, K.G. Moore, J.M. Long, P. Weckler. *Sprayer Evaluation on Tall Pecan Trees*. presented at the 2016 ASABE Annual International Meeting. July 17 – 20, 2016. Orlando, Florida. Paper number 162460314.

Morris, C., P. Weckler, B. Arnall, P. Alderman, J. Kidd, A. Sutherland. *Weather Impacts on UAV Flight Availability for Agricultural Purposes in Oklahoma*. A paper from the Proceedings of the 13th International Conference on Precision Agriculture (ICPA) Jul 31, 2016 to Aug 03, 2016. St. Louis, MO.

Refereed Journal Articles by Undergraduate Scholars

Seaberg, J., Weckler, P., Ringer, J. and Wilber, G., 2020. *Construction and testing of a drinking water disinfection and filtration system for developing nations*. International Journal for Service Learning in Engineering, Humanitarian Engineering and Social Entrepreneurship, 15(1), pp.33-53.

Seaberg, J., P. R. Weckler, G. Wilber, J. Ringer. *Comparison of Locally Generated Chemical Disinfectants for Drinking Water Treatment in Developing Nations*. International Journal for Service Learning in Engineering. Vol. 13, No. 1, pp. 67-83, Spring 2018. ISSN 1555-9033. (<http://www.ijlsle.org>)

Bowser, T., P. R. Weckler, M. Bugg, E. Lam, J. F. Chamberlain. *Improved Field Methods for Construction of Concrete Biosand Water Filter Housings*. International Journal for Service Learning in Engineering. Vol. 11, No. 1, pp. 32-50, Spring 2016. ISSN 1555-9033. (<http://www.ijlsle.org>)

OTHER SCHOLARLY OR CREATIVE ACTIVITIES

Assumed leadership of the **OSU Application Engineering program** upon Dan Thomas' retirement October 2020. Involved with on-going OMA/OSU Application Engineering discussions. Attended several meeting with Dan Thomas and the Application Engineers prior to his retirement..

Senior Advisor, OSU Engineers With Borders, 2009-2021

Traveled to Honduras three times and four times to Guatemala with OSU Engineers Without Borders project teams. Constructed biosand water filters and safer, more fuel efficient wood burning stoves.

Invited to be a member of the External Academic Program Review Team for the Biological Systems Engineering Dept. at University of Nebraska-Lincoln. Conducted site visit and review Sept. 8-12, 2019.

Member of the External Advisory committee of the Engineering & Physics Dept. at Abilene Christian University. Conducted annual departmental review Oct. 17-18, 2019.

PROFESSIONAL ACTIVITIES

PARTICIPATION IN PROFESSIONAL ASSOCIATIONS & ORGANIZATIONS

Member of various professional organizations:

American Society of Agricultural & Biological Engineers (ASABE)
MS-60 Unmanned Aerial Systems -- *organizing & founding member*
EOPD-205 Engineering Technology & Management Education
Secretary (2018-2020)
EOPD-203 Undergraduate & Graduate Instruction
Chair (2014-2015), Secretary (2012-2013)
ITSC-353 Instrumentation & Controls -- Chair (2007-2008, 2008-2009)
ITSC-03 Standards
ITSC-312 Machine Vision
MS-54 Precision Agriculture
MS-58 Ag Equipment Automation

American Society for Engineering Education (ASEE)

Institute of Electrical and Electronic Engineers (IEEE)

Society of Manufacturing Engineers

Society of Photo-Optical Instrumentation Engineers (SPIE)

Tau Beta Pi (National Engineering Honor Society)

Alpha Epsilon (National Agricultural Engineering Honor Society)

Gamma Delta Sigma Honor Society (The Honor Society of Agriculture)

OSU COMMITTEES

• Department

ABET / Curriculum
Computer

• College

CASNR Teaching Effectiveness committee, member 2008-2019, Chair 2009-2010, Co-Chair 2017
Engineering Oversight Committee, ENGSC 2123 – Dynamics
BAE representative on the New Frontiers Ag Hall (NFAH) planning committee

Member of the BAE department head search and screen committee

- **University**

Institute for Teaching and Learning Excellence (ITLE) Advisory Board

STUDENT SERVICE

Senior Advisor of OSU chapter of Engineers Without Borders

Met with numerous potential BAE students and their parents.

OTHER

OSU Graduate Faculty Associate Member

Member of the external advisory committee of the Engineering & Physics Dept. at Abilene Christian University. I

COMMUNITY SERVICE

Jordan Morris Memorial Scholarship Interviews -- Payne Co Extension 2018-2020

Payne County 4-H club leader 2003-2019 -- RETIRED in 2019...!!!!

Sunday school class instructor, Hillcrest Baptist Church, 2004-2020

RESEARCH PROJECTS at OSU

The Rural Renewal Initiative

Rural communities carry substantial cultural and political significance and play a vital role in providing food, water, energy, and recreational opportunities for people in urban and suburban areas. However, many rural communities are threatened by declines in natural and human capital and a growing rural-urban gap in built or technological capital, i.e. the community's physical infrastructure. There is growing need for research to develop effective approaches for improving the natural, human, and built / technological capitals of rural communities, thereby reducing their vulnerability and increasing their resilience.

As communities implement these approaches, they aim for **rural renewal**, which is stopping the downward spiral of declining community capital and beginning to "spiral up". We envision a future in which hope-filled rural renewal movements are growing in every state and nation, engaging an expanding interdisciplinary community of devoted researchers, students, and citizens. In pursuit of that vision, we are working to establish an interdisciplinary **Rural Renewal Initiative** at Oklahoma State University (OSU). *The mission of the Rural Renewal Initiative is to catalyze the renewal of rural communities and places in Oklahoma and beyond through interdisciplinary research, student mobilization, and community engagement.* The Rural Renewal Initiative will support the Land-Grant mission of OSU, utilizing the skills and experience of the entire OSU system and attracting significant external funding. Implementing the Initiative's mission includes:

Establishing Validation Sites for Field-Level Emissions Quantification From Grain Sorghum in Southern Great Plains

Goal: Establish publicly available open-source, high-resolution datasets of greenhouse gas (GHG) emissions, meteorology, soil, vegetation, and unmanned aerial-systems (UAS) based remote sensing data (hyperspectral, thermal, and LIDAR) to support testing and validation of emerging biofuel production monitoring technologies.

Impact: The project team will deploy latest technologies to collect "Gold Standard" data for field-level fluxes of CO₂, N₂O, CH₄ and H₂O in grain sorghum production systems in Texas, Oklahoma, and Kansas. The fluxes are regulated at a very fine level such as soil aggregates - mm in size and associated soil moisture and oxygen availability to microbes. The current estimates of emissions from corn and sorghum production are from point-based measurements extrapolated using modeling approaches that lack field-scale validation or gold standard ground truth data. In addition, the impact of crop management practices on field-level GHG emissions is not well defined.

Hence, measurement of emissions at field-level and protocol development is essential for improving life cycle analysis and bridge gap between feedstock producers and market incentives.

Approach: We propose a closed-path dual laser Eddy Covariance (EC) flux measurement system along with a well-established open-path EC system for simultaneously measuring field-level fluxes of CO₂, N₂O, CH₄, and H₂O. The eddy flux data are combined with sub-acre soil moisture and temperature measurements, plant and soil analysis data (nutrient, composition, carbon, growth, and phenology), spatial surveys of soil EC, pH and color, and hyperspectral, thermal, and LIDAR data from UAS. Grain sorghum crop is managed including planting and harvesting by producers. The project, for the first time, develops a technology to synthesize scientific principles from EC flux, plant & soil science, remote sensing, and crop modeling to measure field-level emissions.

Outcome: Final deliverable for the project will be “Gold Standard” data for quantifying field-level greenhouse gas emissions from grain sorghum production systems. In addition, the measurement of emissions at field-level using state-of-the-art technologies and protocols will improve the life cycle analysis and bridge the gap between feedstock producers and existing market incentives. In addition, the costs for monitoring emissions from field-sites and production risks will be reduced significantly,

Using Big Data & the Internet of Things to Manage Tomorrow’s Agricultural Production Systems

This project will perform an analysis of potential sensing methods and examine commercially available soil sensor systems for use in trafficability estimation, as well as controlling planting and tillage depth. One objective of this project is to analyze the field performance of commercially available soil sensing systems to determine their suitability for use on automated agricultural machinery. The overall goal of this Hatch project is to create robust and intelligent control systems and sensors to help monitor, optimize, and manage autonomous agricultural machinery systems. These highly integrated systems will use sensors to monitor environmental conditions and the performance characteristics of specific units within the system. The big data sets produced by the sensors will be processed in a computer based learning environment to enact real-time machine operational decisions.

Head-to-Head Comparison of Soil Sensor Systems

The overall goal of this project was to determine the ability of the commercial sensor systems to estimate parameters such as; soil moisture depth, organic matter, pH, CEC, soil texture, nitrogen levels, etc. Data analysis included factors such as; speed of collection, accuracy of the data (sensor vs. actual lab analysis), resolution of the sensors, local vs. wide-area (regional or global) calibration, etc. The results and summary included factors such as commercial viability of using one of these sensors on-the-go, without additional passes through the field during planting, tilling, spraying, or other field operations. The tests were conducted on six different fields, at three geographically diverse locations within a 15 mile radius of the OSU campus. Each location had significantly different soil types and cropping systems.

Conclusions: Four significantly different mobile soil sensing systems were tested by OSU. Each system had differences in terms of accuracy, ease of operation, robustness and type of soil parameters sensed. Natural spatial and temporal variability in soil parameters makes on-the-go sensing a challenge. The physical operating environment (undulating motion, vibration, dust, moisture, chemicals, EMI, etc.) adds to the sensing difficulties. Addition of soil sensors to planting and tillage equipment, as well as to autonomous vehicles is challenging and will be area of continuing effort.

Next-Generation Biosensor Development for Precision Farming:

Detection of multi-spectral reflectance for discriminating small spatial features in the crop could be accomplished by reducing the sensed area, and should be possible with the use of lasers. This research will fabricate a laser-based biosensor to confirm this possibility. As part of this ongoing research program, a project that evaluated GPS and radar ground speed measurements under varying vegetative conditions was completed. Previous work in this area included research on measurement of soil moisture using radio wave reflections. Additional work in both of these areas is anticipated in the future.

BugTV -- A Smart Bug Trap:

This research will develop a "smart" bug counter to incorporate this wireless monitoring system for pecan weevil monitoring.

Pecan Weevil Larvae Detection:

Recent work on near-infrared (NIR) sensing of foods has shown potential for improved discrimination between larvae and nutmeat. We will investigate the feasibility of using NIR reflection and/or transmission to differentiate nutmeat from larvae.

Biosensor Development for Horticultural Products

This project developed a method for rapid estimation of Lycopene concentration in watermelon and tomato puree using fiber optic visible spectroscopy.

Multispectral Optical Sensing

Multispectral digital imaging and UV-Vis-NIR spectroscopy have been used to acquire hyperspectral data on plant water stress, spectral image data on beef steaks for tenderness evaluation and on spinach fertilizer trial field plots at Bixby. The multispectral camera system has been integrated into a Cessna 172 for airborne NDVI measurements

Biosensor Development – Plant Biomass:

Digital imagery will be used to estimate coverage with simultaneous measurement of height with sonar technology. Evaluation of the product of plant height and vegetative coverage estimates will be conducted to establish a correlation with plant biomass. Electromagnetic techniques will be used to measure dielectric properties of plant materials. Biomass estimates will be obtained from the dielectric measurements and correlated to actual biomass

Nondestructive Evaluation of Agricultural Products using X-Ray Digital Imaging

The project involved development of a digital x-ray imaging system for nondestructive evaluation of agricultural products and other biological materials. The camera system was initially used for imaging (in-the-shell) pecan nuts.

Biofuel from Food Processing Waste Products

Based on the positive results of the initial FRIP project, Bar-S Foods funded additional follow-on work in preparation for a large pilot scale project.

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Previous Consulting:

Pacific Receivables, LLC, vs. T-3 Greenhouse Supply LLC, Thomas E Rawlings, Matthew Hawk

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**EXPERT DECLARATION OF DR. PAUL WECKLER IN SUPPORT OF *INTER PARTES* REVIEW OF U.S. PATENT
NO. 8,585,341**

In support of a Petition for Inter Partes Review of United States Patent No. 8,585,341 owned by Sandbox
Enterprises, LLC (“Sandbox” or “Patent Owner”).
Retained in this matter by Baker Botts L.L.P. (“Counsel”) on behalf of Halliburton Energy Services, Inc. (“Petitioner”).
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**MONSANTO COMPANY and MONSANTO TECHNOLOGY LLC, Plaintiffs/Counterclaim Defendants, v.
PIONEER HI-BRED INTERNATIONAL, INC. and E.I. DU PONT DE NEMOURS AND COMPANY,
Defendants/Counterclaim Plaintiffs**

UNITED STATES DISTRICT COURT EASTERN DISTRICT OF MISSOURI, EASTERN DIVISION

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