CURRICULUM VITAE

Debankur Sanyal Assistant Professor and Specialist, Soil Health Department of Environmental Science The University of Arizona 1332 W Glenmere Dr, Chandler, AZ 85224 +1 701-781-9295 dsanyal@arizona.edu

CHRONOLOGY OF EDUCATION

2018, Ph.D. in Soil Science, Dissertation title: Symbiotic Nitrogen Fixation in Dry Bean (*Phaseolus vulgaris* L.) Cultivars, Major Advisor: Dr. Amitava Chatterjee

2015, MS in Soil Science and Agricultural Chemistry, Thesis title: Potassium Dynamics in a Long-Term Fertilizer Experiment under Rice-Wheat Cropping System, Major Advisor: Dr. Babu Singh Brar

2013, BS in Agriculture (Hons.), Specialization: Natural Resource Management, Crop Production and Commercial Agriculture

CHRONOLOGY OF EMPLOYMENT

2022- current: Assistant Specialist, Soil Health and Assistant Professor, Department of Environmental Science, University of Arizona

2020-2022: Postdoctoral Research Associate, South Dakota State University

2018-2020: Project Coordinator and Research Associate 1, South Dakota State University

HONORS AND AWARDS

2018, Certificate for outstanding achievement from Gamma Sigma Delta, NDSU Chapter

2017, Dr. Charles E. Kellogg Scholarship Award, North Dakota State University

2016, Clarence and Cora Engberg Scholarship Award, North Dakota State University

2015, Dr. N.S. Randhawa Gold medal, Punjab Agricultural University

2015, Academic Scholar during MS, Punjab Agricultural University

2013-15, All India Junior Research Fellowship (merit), ICAR Govt. of India

2009-13, University Merit Scholarship, Govt. of West Bengal, India

SERVICE AND OUTREACH

Local/State Service and Outreach

2023-present, State Co-coordinator, Western Sustainable Agricultural Research and Extension (SARE)

2023, Co-organizer, Soil Health Workshop (funded by Western SARE) in Safford, AZ

2023, Co-organizer, Southwest Ag Summit 2023, Breakout Session: Soil Health in the Desert: Combating Water Crisis in the Southwest in Yuma, AZ

2022-present, Member, Arizona Agriculture Extension Association (AAEA)

National/International Service and Outreach

2023-24, Vice-leader (elected), American Society of Agronomy-Biochar Community

2023-24, Peer Reviewer, United States Department of Agriculture, Specialty Crop Research Initiative Multistate Proposals

2023, Peer Reviewer, United States Department of Agriculture, NIFA ORG 2023 Research Proposals

2023-24, Technical Editor, Frontiers in Agronomy-Special Issue

2022-present, Associate Editor, Agronomy Journal

2023, Session Moderator, Impact of Cover Crops on Soil, Water and Conservation Management Oral, ASA-CSSA-SSSA Annual Conference, St. Louis, MO

2022-present, Member, Western Cover Crop Council-Southeast Region

2022-present, Co-organizer, Sustainable Regional Systems Research Networks (SRS RNs) Awards - National Science Foundation (NSF)

2022, Peer Reviewer, Water Resources Research Act general proposals 2022

Memberships in Professional Societies

2017-present, Member, American Society of Agronomy (ASA)

2017-present, Member, Crop Science Society of America (CSA)

2017-present, Member, Soil Science Society of America (SSSA)

Departmental Committees

2022-present, Member, UA Vitae Peer Review Committee, Department of Environmental Science

2022-present, Member, Graduate Student Committee, Department of Environmental Science

2022, Member, Integrated Post Management Extension Assistant Search Committee, University of Arizona Cooperative Extension

2022, Member, Postdoctoral Research Associate in Integrated Post Management Search Committee, University of Arizona Cooperative Extension

College Committees

2023, Member, Pinal County Extension Agent Search Committee, University of Arizona Cooperative Extension

2022-2023, Member, Director of Maricopa Agricultural Center Search Committee

2022- ongoing, Reviewer, Water Irrigation Efficiency Grant Committee, University of Arizona

TEACHING, ADVISING, AND MENTORSHIP

Advising and Mentorship

Taylor Arp, MS Graduate Research Assistant, Dept. of Environmental Science (Major Advisor)

Jose Maria Hernandez Ornelas, MS Graduate Student, Dept. of Environmental Science (Major Advisor)

Charles Stackpole, Research Technician II, Dept. of Environmental Science (Supervisor)

Xiaobo Hou, Ph.D. Graduate Student (Major advisor: Dr. Karletta Chief)

Member, Transitioning to The Workforce Mentoring Committee, American Society of Agronomy (ASA), Crop Science Society of America (CSA), Soil Science Society of America (SSSA)

PUBLICATIONS

Google Scholar: <u>https://scholar.google.com/citations?user=bwcunzEAAAAJ&hl=en</u>

Refereed Journal Articles

Bansal, S., D. Sanyal, C. Graham, J. Gonzales, and S. Kumar. 2024. Impacts of Stocking Densities on Soil Biochemical and Microbial Properties in a Mixed-Grass Prairie Ecosystem at Two Landscape Positions. Frontiers in Sustainable Food Systems, 8, 1254973. doi: 10.3389/fsufs.2024.1254973 Orr, E., R. Masson, D. Sanyal, D. E. Elshikha. 2023. Surviving These Drying Times: The Role of a Desert Agricultural Extension Agent in Helping Farmers Face Drought. Journal Of The NACAA, 16 (2), 1-10.

Sanyal, D., A. Mukherjee, A. Rahhal, J. Wolthuizen, D. Karki, J. D. Clark, and A. Bly. 2023. Cover crops did not improve soil health but hydroclimatology may guide decisions preventing cash crop yield loss. Frontiers in Soil Science, 3, 1111821. doi: 10.3389/fsoil.2023.1111821

Mukherjee, A., P. Roy, D. Sanyal, T.N. Roy, S. Wang. 2023. Does socio-economic dynamics influence crop yield variability? Current Science, 125, 8: 846-852. doi: 10.18520/cs/v125/i8/846-852

Bielenberg, H., J. Clark, D. Sanyal, J. Wolthuizen, D. Karki, A. Rahhal, and A. Bly.
2023. Cover crop composition in long-term no-till soils in Semi-Arid
environments do not influence soil health measurements after one year. Soil
Science Society of America Journal, 87:528–540. doi: 10.1002/saj2.20523

Bielenberg, H., J. Clark, D. Sanyal, J. Wolthuizen, D. Karki, A. Rahhal, and A. Bly. Precipitation and Not Cover Crop Composition Influenced Corn Economic Optimal N Rate and Yield. 2023. Agronomy Journal, 115(1), 426-441. doi: 10.1002/agj2.21265.

Sanyal, D., and C. Graham. 2022. Using the Haney Soil Test to Predict Nitrogen Requirements in Winter Wheat (*Triticum aestivum* L.). Nitrogen 3(2): 376-386.

Graham, C., H. van Es, and D. Sanyal. Soil Health Changes from Grassland to Row Crop Conversion in the Northern Great Plains. American Society of Agronomy, Crops & Soils Magazine, September–October 2022. DOI: 10.1002/crso.20219

Sanyal, D., J. Wolthuizen, A. Bly. 2021. Influence of Nitrogen Fertilization Rate on Soil Respiration: A Study Using a Rapid Soil Respiration Assay. Nitrogen 2: 218-228.

Sanyal, D., A. Rahhal, J. Wolthuizen, A. Bly. 2021. Identifying Diversity and Activities of Soil Microbes Using Pigmentation Patterns on Buried Cotton Strips: A Novel Approach, Communications in Soil Science and Plant Analysis, DOI: 10.1080/00103624.2021.1908328

Graham, C., M. Ramos-Pezzoti, H. van Es, and D. Sanyal. 2021. Short-term soil health effects from the conversion of grassland to row crops by tillage in the northern Great Plains. 26: e00425

Sanyal, D., J.M. Osorno., A. Chatterjee. 2020. Influence of Rhizobium inoculation on dry bean yield and symbiotic nitrogen fixation potential, Journal of Plant Nutrition 43 (6): 798-810. doi: 10.1080/01904167.2020.1711946

Sanyal, D., S. Solanki., G. Ameen., R. Brueggeman., A. Chatterjee. 2020. Understanding the Expression Dynamics of Symbiont Rhizobial nifH and Nitrogen Assimilatory NR and GS Genes in Dry Bean Genotypes at Various Growth Stages. Legume Science e26. doi: 10.1002/leg3.26.

Saha, M., P. K. Bandyopadhyay, A. Sarkar, R. Nandi, K. C. Singh, D. Sanyal. 2020. Understanding the Impacts of Sowing Time and Tillage in Optimizing the Micro-Environment for Rainfed Lentil (*Lens culinaris* Medik) Production in the Lower Indo-Gangetic Plain. Journal of Soil Science and Plant Nutrition 20 (4): 2536-2551. doi: 10.1007/s42729-020-00319-6

Sanyal, D.; B.S. Brar., G.S. Dheri. 2019. Organic and Inorganic Integrated Fertilization Improves Non-exchangeable Potassium Release and Potassium Availability in Soil. Communications in Soil Science and Plant Analysis, 50 (16): 2013-2022. doi: 10.1080/00103624.2019.1648660

Chatterjee, A., D. Sanyal, and D. Olson. 2019. Influence of Stabilizer Addition and Application Rate on Nitrogen Use Efficiency of Corn (*Zea mays* L.). Crops and Soils, 52 (4): 24-37. doi: 10.2134/cs2019.52.0409

Sanyal, D., R.J. Goos., and A. Chatterjee. 2018. Determining Biological Nitrogen Fixation in Dry Beans using Ureide and Isotope-Dilution Techniques. Communications in Soil Science and Plant Analysis, 49 (16): 2042-2052. doi: 10.1080/00103624.2018.1495727

O'Brien, P. L., U. Acharya, R. Alghamdi, A. R. Niaghi, D. Sanyal, J. Wirtz, A. L. M. Daigh, and T. M. DeSutter. 2018. Hydromulch Application to Bare Soil: Soil Temperature Dynamics and Evaporative Fluxes. Agricultural and Environmental Letters 3:1 180014. doi:10.2134/ael2018.03.0014 (*all authors with equal contribution)

Graham, C., J. Loya, D. Sanyal, and S. Subramanian. Assessing the use of native rhizobia to improve nitrogen fixation under abiotic stress. Agrosystems, Geosciences & Environment (First review received)

Sanyal, D., J. Wolthuizen, D. Karki, A. Bly. A Comprehensive Analysis of Regenerative Agriculture and the Roles of Soil Health Practices (under review in Archives of Agronomy and Soil Science) Sanyal, D., B. S. Brar, G.S. Dheri, D. Sihi, B. Dari. Temporal changes in Potassium forms in a long-term fertilizer experiment under rice-wheat cropping system (In preparation)

Sanyal, D., T. Das, R. Mukherjee, A. Bezbaruah. Nanotechnology Applications for Aqueous Phosphate Removal and Recovery (in preparation)

Peer-reviewed Conference Proceedings

Elshikha, D.E.M., S. Attalah, P.M. Waller, D.J. Hunsaker, K.R. Thorp, C. Williams, M. Katterman, D. Sanyal, G. Wang, D. Dierig, and D.T. Ray. 2023. Guayule Germination and Growth under Subsurface Gravity Drip and Furrow Irrigation in Arizona. In 2023 ASABE Annual International Meeting (p. 1). American Society of Agricultural and Biological Engineers.

Peer-Reviewed Extension Publications

Gornish, E., B. Rein, J. Blankinship, P. Johnstone, and D. Sanyal. 2024. Soil health perspectives of Arizona rangeland stakeholders. The University of Arizona Cooperative Extension Publication Number: AZ2077-2024

Sanyal, D., J. Heun, C. Stackpole, P. Andrade-Sanchez. 2023. The University of Arizona Cooperative Extension Publication Number: AZ2074-2023. <u>https://extension.arizona.edu/pubs/evaluating-situ-low-cost-soil-co2-sensor-soil-health-assessment-tool-agricultural-soils</u>

Sanyal, D., R. Masson, C. Stackpole, T. Arp. 2023. A Soil Health Needs Assessment Survey in Arizona. The University of Arizona Cooperative Extension Publication Number: AZ2067-2023. <u>https://extension.arizona.edu/pubs/soil-</u> <u>health-needs-assessment-survey-arizona</u>

Sanyal, D., C. Stackpole, S. B Megdal. 2023. Evaluating Forage Cover Crop Mixes for the Desert Southwest. The University of Arizona Cooperative Extension Publication Number: AZ2062-2023.

https://extension.arizona.edu/pubs/evaluating-forage-cover-crop-mixes-desertsouthwest

Sanyal, D., C. Stackpole, R. Masson. 2023. Yuma Soil Health Survey 2022: A Discussion on POX-C, PMN, and Soil Protein. The University of Arizona Cooperative Extension Publication Number: AZ2059-2023.

https://extension.arizona.edu/pubs/yuma-soil-health-survey-2022-discussionpox-c-pmn-soil-protein

Sanyal, D., J. Wolthuizen, A. Bly. 2020. "How's Life in the soil?" Ask (count) the Earthworms. <u>https://extension.sdstate.edu/hows-life-soil-ask-count-earthworms</u>

Sanyal, D., J. Wolthuizen, A. Bly. 2020. Cotton Strip Soil Test: Rapid Assessment of Soil Microbial Activity and Diversity in the Field. <u>https://extension.sdstate.edu/cotton-strip-soil-test-rapid-assessment-soilmicrobial-activity-and-diversity-field</u>

Sanyal, D., C. Stackpole, N. Pier. Conceptualizing Soil Health: The Human Health Connection. The University of Arizona Cooperative Extension Publication (under review).

Conference Articles

Elshikha, D. E. M., S. Attalah, P. M. Waller, D. J. Hunsaker, K.R. Thorp, C. Williams, M. Katterman, D. Sanyal, G. Wang, D. Dierig, D. T. Ray. 2023. Guayule Germination and Growth under Subsurface Gravity Drip and Furrow Irrigation in Arizona. In 2023 ASABE Annual International Meeting (p. 1). American Society of Agricultural and Biological Engineers.

Book Chapters

Raghunandan, K., S. Dutta, R. Thribhuvan, R. Bhowmick, N. K. Chourasia, J. K. Meena, A. Das, H. H. Kumaraswamy, D. Sanyal, S. N. Mandal. Breeding minor pulses for climate resilience in the era of genomics: opportunities and prospects. Springer Nature (*in preparation*)

Solanki, S., G. Ameen, D. Sanyal, K. Chittem, S. Jain, S. Lall, A. Kumar, L. Brueggeman, R. Brueggeman. 2020. Friends and Foes: Phyto-Microbial Interactions in Molecular Perspective. (eds) Phyto-microbiome in Stress Regulation, pp. 81-98, Environmental and Microbial Biotechnology. Springer, Singapore. doi: 10.1007/978-981-15-2576-6_5

*Dheri, G.S., B.S. Brar, D. Sanyal. 2016. Salt-Affected Soils: Nitrous Oxide Emissions. (Ed. Rattan Lal) In: Encyclopedia of Soil Science (Third Edition). Taylor and Francis Publishing, United Kingdom. eBook ISBN: 9781498738934, page no. 1969-1971.

*Dheri, G.S., B.S. Brar, D. Sanyal. 2016. Brick Making: Soil Degradation. (Ed. Rattan Lal) In: Encyclopedia of Soil Science (Third Edition). Taylor and Francis Publishing, United Kingdom. eBook ISBN: 9781498738934, page no. 255-257.

Popular Publications

Wolthuizen, J., D. Sanyal. 2021. Agriculture Triggered Drought is Causing Desertification. Mod Concep Dev Agrono. 8(5): 859-860. DOI: 10.31031/MCDA.2021.08.000699

Sanyal, D. and J. Wolthuizen. 2021. Regenerative Agriculture: Beyond Sustainability. Int J. Agri Res Env Sci. 2(1):17–18. DOI: 10.51626/ijares.2021.02.00007

Media Coverage

Migoya, C. "Central Arizona farms rely on groundwater. How research aims to help farmers adapt, protect aquifers" by Clara Migoya, Arizona Republic. Link: https://www.azcentral.com/story/news/local/arizonaenvironment/2023/01/27/research-project-to-develop-better-tools-for-pinalagriculture/69841975007/

Other

CONFERENCES AND SCHOLARLY PRESENTATIONS

Invited Presentations at Regional, National, and International Scientific Conferences

Building Partnerships for Agricultural Sustainability Summit, Sustainable Agricultural Research and Education (SARE), Phoenix, AZ "Partnerships to Select Potential Cover Crops for Arizona" (Dec 12, 2024)

Natural Resource Conservation Service Annual Meeting, Sedona, AZ, "Opportunities to Climate-Smart Soil Health Management in Arizona" (Aug 23, 2023)

SYAHI Carbon Climate Collaborative Network (CCCN) Talk series, Virtual, "Soil Health Management for Commercial Agriculture" (Apr 30, 2023)

Water and Agriculture: Chile-Arizona Experience Webinar, Virtual, "Managing Carbon in the Desert: Introducing Healthy Desert Soils Initiative" (Nov 29, 2022)

International Conference on Contribution of Agriculture for Challenges and Opportunity of Food Security till 2030, Virtual, "Healthy Soils for Healthy Foods: A Climate-Smart Approach" (Oct 16, 2022)

International Pepper Conference, Pearce, AZ, "Chile Pepper Production in the Southwest USA-Soil Health Approach" (September 27, 2022)

Invited Seminars

2024

AZ COWS Workshop, V bar V Ranch, Rimrock, AZ, "Pasture Cover Crops for Soil health Improvements in the Desert" (Feb 2, 2024)

Cotton Production Workshop, Safford, AZ "Soil Health Considerations for Optimum Nutrient and Pest Management in Cotton" (Feb 1, 2024)

Desert Ag Research Symposium, Yuma, AZ, "Healthy Desert Soil Initiative: Updates from a Soil Health Research and Extension Program" (Jan 9, 2024)

2023

Southeast Pinal County Master Gardeners, Virtual, "Nutrient Deficiencies in Plants and How to Improve Soils" (Dec 13, 2023)

Arizona Winter Viticulture Symposium, Tucson, AZ, "Vineyard Soil Health and Fertility" (Dec 5, 2023)

Farming Under Extreme Weather Conditions: Building Soil Health and Cultivating Financial Resiliency, Florence, AZ, "Building Soil Health through Amendments and Cover Crops" (Nov 29, 2023)

DASHI Grower Workshop, YCEDA, Yuma, AZ, "Diagnosing Soil Health in the Desert" (Nov 9, 2023)

Maricopa County Cooperative Extension, Tempe, AZ, "Soil Health Management in an Urban Farm" (Oct 18, 2023)

Livestock Workshop, UACE, Parker, AZ, "Evaluating Alternative Forage Crops for Healthy Soils in the Desert" (Sep 15, 2023)

AZ COWS Workshop, Rimrock, AZ, "Soil Health 101: Principles and Management" (Sep 1, 2023)

Alfalfa and Forage Tent Talk, Buckeye, AZ, "Considerations for alternative forage in the desert" (Aug 28, 2023)

New Technologies Conference, Maricopa, AZ, "Diagnosing Soil Health: Modern Tools and Techniques" (May 3, 2023)

Alfalfa and Forage Workshop, Maricopa, AZ, "Soil Health Diagnosis & Improvements For Forage Crop Management" (Apr 19)

2023 Farm, Home, and Ranch Day, Thatcher, AZ, "Soil Health Considerations for the Desert Southwest" (Mar 8, 2023)

Southwest Ag Summit, Yuma, AZ, "The Nexus of Soil Health and Soil Fertility" (Feb 23, 2022)

Urban Ag Hour, Tempe, AZ, "Healthy Soils for Urban Farms" (Feb 22, 2023)

Southeastern Arizona Farm and Ranch Trade Show, Wilcox, AZ, "Soil Health Management in the Desert Southwest" (Feb 8, 2023)

2022

Spaces of Opportunity, Phoenix, AZ, "Understanding Soil Test Results" (Dec 17, 2022)

University of Arizona Cooperative Extension, Snowflake, AZ, "Cover Crop Considerations for High-elevation Agriculture" (Dec 8, 2022)

University of Arizona Cooperative Extension, Phoenix, AZ, "Healthy Soils for Urban Farms " (October 27, 2022)

Yuma Center of Excellence for Desert Agriculture, Yuma, AZ, "Introducing the Healthy Desert Soils Initiative" (November 16, 2022)

Yuma Fresh Vegetable Association, Yuma, AZ, "Soil Health Needs, Assessment & Management in Arid & Semi-Arid Environments of Arizona" (February 24, 2022)

Arizona Association of Conservation Districts, Phoenix, AZ, "Soil Health and Conservation: A Comprehensive Approach" (August 4, 2022)

University of Arizona Cooperative Extension, Yuma, AZ, "Soil Health: The Role of Soil Amendments" (July 26, 2022)

University of Arizona Cooperative Extension, Benson, AZ, "Building Soil Health with Cover Crops" (May 6, 2022)

University of Arizona Cooperative Extension, Elfrida, AZ, "Soil Health Research & Extension Program For Arizona: An Outlook" (April 27, 2022)

University of Arizona Cooperative Extension, Maricopa, AZ, "Soil Health Program for Alfalfa and Forage Crops in Arizona" (April 21, 2022)

University of Arizona Cooperative Extension, Mesa, AZ, "Soil Health Research Based Extension Program for Arizona: An Outlook" (April 6, 2022)

Center for Food Safety and Applied Nutrition, Office of Food Safety, U.S. Food and Drug Administration, Virtual, "Soil Health Needs & Management" (January 27, 2022)

University of Arizona Cooperative Extension, Goodyear, AZ, "Soil Health Improvements in Arid and Semi-Arid Environments of Arizona" (January 20, 2022)

Contributed Talks to Professional Conferences (Non-Invited)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, St. Louis, MO, "Evaluating Potential Cover Crops in the Desert Southwest" (Oct 30, 2023) University of Arizona Cooperative Extension Annual Conference, Tucson, AZ, "Selecting Cover Crop Mixes for Desert Southwest" (August 2, 2023)

University of Arizona Cooperative Extension Annual Conference, Tucson, AZ, "Forage Water Utilization and Regulatory Restrictions Survey in Arizona's Dairy Sector" (August 2, 2023)

UCOWR/NIWR Annual Water Resources Conference, Fort Collins, CO, "Selecting Cover Crop mixes for Water-limited Environments of Southwestern US" (Jun 14, 2023)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, Baltimore, MD, "Evaluating an in-Situ, Low-Cost, Soil CO2 Sensor As a Soil Health Assessment Tool in the Desert Southwest" (Nov 7, 2022)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, Baltimore, MD, "Soil health and Cover Crops: A 4-year Study from South Dakota" (Nov 9, 2022)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, Virtual, "Understanding How Cover Crops Influence Soil Health and Nutrient Cycling" (March 9, 2021)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, Virtual, "Cover Crops towards Soil Health Improvements" (March 8, 2021)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, Virtual, "Cover Crops Relation with Soil Health and Nutrient Availability to Cash Crops" (March 8, 2021)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, Virtual, "Can Cover Crops Help to Improve Soil Health While Having a Positive Effect on Corn Yield?" (March 8, 2021)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, San Antonio, TX, "Cover crops influence soil health, nutrient cycling, and yield in South Dakota" (Nov 11, 2019)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, San Antonio, TX, "Cover Crop Influences Nutrient Cycling, Soil Moisture, Soil Health, and Corn Yield in South Dakota" (Nov 13, 2019)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meeting, San Antonio, TX, "Responses of Soil Hydrological, Physical, and Biological Properties to Short and Long-Term No-till Systems" (Nov 13, 2019)

North Central Extension Industry Soil Fertility Conference, Des Moines, IA, "Cover crops influence soil health, nutrient cycling, and yield in South Dakota" (Nov 6, 2019)

ND, SD, and MN NCSS Technical Planning Workshop, Fargo, ND, "Cover crops influence soil health, nutrient cycling, and yield in SD" (April 9, 2019)

Soil Health Conference, ISU, Ames, IA, "Cover crops influence soil health and nutrient cycling in South Dakota" (Feb 4, 2019)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meetings, Tampa, FL, "Understanding the Expression Dynamics of Rhizobial *nifH* and Dry Bean *NR* and *GS* Genes" (Oct 24, 2017)

American Society of Agronomy-Crop Science Society of America-Soil Science Society of America Annual Meetings, Tampa, FL, "Biological Nitrogen Fixation in Dry Bean Cultivars Inoculated with Rhizobia" (Oct 23, 2017)

SNRS Symposium, NDSU, Fargo, ND, "Understanding the Expression Dynamics of Rhizobial nifH and Dry Bean NR and GS Genes" (Dec 4, 2017)

SNRS Symposium, NDSU, Fargo, ND, "Nitrogen fixation potentials of four dry bean market classes" (2016)

AWARDED GRANTS AND CONTRACTS

Federal Grants Awarded

2024-2028 "Climate-Smart Cotton: Developing Precision Regenerative Practices and Market Opportunities for Addressing Climate Change in the US Cotton Belt" United States Department of Agriculture// \$224,998 total – 4% paid effort, co-PI (Randy Norton, University of Arizona, co-PI; Muthu Bagavathiannan, Texas A&M, PI) 2024-2026 "Aqua Steady, an Alginate-based Hydrogel for Sustainable Agriculture in a Changing Climate", National Science Foundation//\$600,000 total – 4.4% paid effort, co-PI (John Chorover, University of Arizona, Pi; Cindie Kehlet, Pratt Institute, PD)

2023-2027 "Building a Climate Smart Domestic Rubber Industry and a Solution for Growers to a Water Crisis", USDA NRCS Partnerships for Climate-smart Commodities // ~\$35,000,000 total (awarded, under advanced negotiation) – 22% paid effort, Co-PI (PI: Kim Ogden, University of Arizona)

2023-2025, "Do Water Sanitizers Change Soil Biology in Romaine Lettuce Fields?", Arizona Dept. of Agriculture (AZDA)// \$99,883 total (\$0 Indirect cost)– 1% paid effort, PI (Channah Rock and Alber Barberan, University of Arizona; co-PIs)

2022-2024, "Soil Health Following Water Sanitization in Romaine Lettuce Production System", Arizona Dept. of Agriculture (AZDA)// \$90,708 total (\$0 Indirect cost)– 1% paid effort, PI (Channah Rock, University of Arizona; co-PI)

2022-24, "Investigating Nitrogen Fertilizer Rates for Sustainable Arizona Pecan Production" Arizona Department of Agriculture// \$51,639 total, PI (Randy Norton, University of Arizona, co-PI)

2023 "Climate-SMART (Specific Management for Arizona Resilience and Transformation) through Ag BMPs", USDA NRCS Partnerships for Climatesmart Commodities// \$105,964 – 5% paid effort, PI (Lead Institution: Arizona Association of Conservation Districts)

2021-2026 "SRS RN: Transforming Rural-Urban Systems: Trajectories for Sustainability in the Intermountain West", National Science Foundation (NSF) Sustainable Regional Systems Research Networks (SRS RNs) Program// \$1,250,000 total – 2% paid effort, Senior Personnel (PI: Mark Stone, University of New Mexico; Institutional Lead: Karletta Chief)

2022-2024 "Trees for the future: Coordinated use of genetic tools to develop geographic and climate adapted pecan" United States Department of Agriculture//\$336,507 total, 1% paid effort, co-PI (Dr. Randy Norton, University of Arizona, PI; Dr. Jennifer Randall, New Mexico State University, PD)

2022-26 "Sustaining Groundwater and Irrigated Agriculture in the Southwestern United States under a Changing Climate" United States Department of Agriculture National Institute of Food and Agriculture//\$414,140 total, 4% paid effort, senior personnel (Sharon Megdal, University of Arizona, co-PI; Isaya Kisekka, University of California-Davis, PI) 2022-2026 "Quantifying Ecosystem Services in Turfgrass Systems", USDA Agricultural Research Service NACA// \$44,867 (\$0 Indirect Cost) – no paid effort, PI (Reagan Hejl, USDA-ARS, PI; Des Serba, USDA-ARS, co-PI)

2021-2025 "Assessing Soil and Plant Health Response to Composted and Solarized Grape Pomace with Manure in Semi-arid Soil", United States Department of Agriculture// \$575,000 – Senior Personnel (Judith brown, University of Arizona, PI)

Other Grants Awarded (State, Industry, Private Foundation)

2024 "Evaluating Biofertilizers to Improve Soil Health and Cotton Production in the Desert", Cotton Incorporated-Arizona Cotton Growers Association// \$19,100 total (\$0 Indirect Cost) – 0% paid effort, PI (Randy Norton, University of Arizona, co-PI)

2023 "CPS Flood Rapid Response", Center for Produce Safety// \$149,028 total, co-PI (Channah Rock, University of Arizona, PI)

2023 "Assessing Water Use Efficiency on Dairy and Crop Farms in AZ", The Walton Family Foundation - Dairy Management, Inc.// **\$59,500 total** – 1% paid effort, co-PI (Duarte Diaz, University of Arizona; George Frisvold, University of Arizona; Elbert Norton, University of Arizona, co-PIs)

2022-23 "Evaluating Winter Small Grain Crops for Water Productivity and Soil Health Dynamics Under Deficit Irrigation Regime in Desert Agricultural Systems of Arizona" Arizona Grain Research and Promotion Council// \$19,900 total (\$0 Indirect Cost) – 0% paid effort, PI (Kelly Thorp and Prasad Bandaru, USDA ARS, co-PIs)

2022-23, "Healthy Desert Soils Initiative: Building the First Comprehensive Soil Health Assessment Framework for Arizona", iViP - USDA NIFA Hatch, \$86,610 total (\$0 Indirect Cost) - 0% paid effort, PI (Channah Rock, University of Arizona; Charles Sanchez, University of Arizona, co-PIs)

2022-23 "Comprehensive Soil Health Survey and Assessment in Yuma", Yuma Center of Excellence for Desert Agriculture(YCEDA)// \$10,000 total (\$0 Indirect cost) – 0% paid effort, PI (Robert Masson, Cooperative Extension, co-PI)

2022-23 "Dynamics of Soil Microbial Respiration of Rotations with Durum as Winter Crop in Arizona: Role of Durum Production in Maintaining Soil Health" Arizona Grain Research and Promotion Council// \$20,354 total (\$0 Indirect Cost) – 0% paid effort, co-PI (Pedro Andrade, University of Arizona, PI)

2022 "Evaluating Soil Health Status in The Irrigated Cotton Production Systems of Arizona", Cotton Incorporated-Arizona Cotton Growers Association// \$18,870

total (\$0 Indirect Cost) – 0% paid effort, PI (Joseph Blankinsmith and Jeff Silvertooth, co-PIs)

Submitted Grants (Not Awarded) *this will include pending grants that are currently under review (mark these as [pending]*

2024-2026 "Evaluating Potential Cover Crop Options for Soil Health Improvements in Water-Limited Desert Environments", United States Department of Agriculture// \$297,554 total – PI [pending]*

2024-2028 "Evaluating the Application of Wastewater Biosolids on Agricultural Lands for PFAS Accumulation and Potential Management Toward Sustainable Agroecosystem", United States Department of Agriculture// \$200,318 total – PI (Sanjay Mohanty, University of California, Los Angeles, PD) [pending]*

2024-2028 "Improving the Sustainability of Agriculture in an Arid Region through Precision Water and Nutrient Management Practices", United States Department of Agriculture// \$3,192,339 total– co-PI (Pedro Andrade and Diaa Eldin Elshikha, University of Arizona, co-PIs; Stephanie Slinski, YCEDA, PD) [pending]*

2024-2028 "Evaluating the Impacts of Novel Crop Rotations on Soil Health and Sustainability of the Desert Agroecosystems", United States Department of Agriculture// \$749,977 total – PI (Pedro Andrade, Joseph Blankinship, University of Arizona, co -PIs) [pending]*

2024-2025 "Evaluating Strategies to Mitigate Cadmium Toxicity in Soils Growing Spinach in Salinas Valley", California Leafy Greens Research Proposal// \$29,742 total – PI (Channah rock, University of Arizona, co-PI) [pending]*

2024-2027 "Evaluating Potential Cover Crop Mixes for the arid and semi-arid Southwest", United States Department of Agriculture Sustainable Agricultural Research and Education// \$349,455 total – PI (George Frisvold, Ayman Mostafa, and Duarte Diaz, University of Arizona, co-PIs) [pending]*

2024-2027 "Enabling Precision Agriculture in the Arid Region by Integrating Aerial Remotely Sensed Data for Pecan Orchards", United States Department of Agriculture// \$50,103 total – PI (Gejegunte, University of Texas-El Paso, PD) [pending]*

2025-2027 "Evaluating the Impacts of Water Sanitizers on Soil Health in Romaine Fields and Potential for Cover Crops and Biofertilizer Use", Center for Produce Safety// \$399,851 total – PI (Channah Rock, University of Arizona, co-PI; Kerry Cooper, University of Arizona, co-PI) [pending]* 2024-2027 "Developing Foundational Geospatial AI Interoperable Framework for Characterizing In-Field Soil Variability", United States Department of Agriculture// \$264,000 total – PI (Pedro Andrade, University of Arizona, co-PI; Papia Rozario, University of Wisconsin, PD) [pending]*

2023-2026 "Evaluating Potential Cover Crop Species Mixes for Soil Health Improvements, Water Savings, and Farm Profitability in the Arid and Semi-arid environments", United States Department of Agriculture - Western Sustainable Agriculture Research and Education//\$349,430 total (\$31,766 Indirect Cost) – 4% paid effort, PI (Ayman Mostafa, University of Arizona, co-PI) [pending]*

2023-2025 "Improving on-field irrigation efficiency in Arizona", United States Department of Agriculture Natural Resources Conservation Service// \$4,000,000 total – co-PI (Diaa Eldin Elshikha, University of Arizona, PI) [pending]*

2024-2026 "Development of an integrated tree-crop-livestock (TCL) system in Santa Cruz County, Arizona to enhance long-term soil health, crop and livestock production, and natural resource conservation", United States Department of Agriculture Western Sustainable Agriculture Research and Education// \$74,999 total – co-PI (Rodolfo Martinez, University of Arizona, PI) [pending]*

2024-2025 "Integrating smart tillage, cover cropping and variable-rate technologies into climate-adaptive soil management strategies to improve Nitrogen use efficiency in the Lower Colorado", California Department of Food and Agriculture// \$224,998 total – co-PI (Pedro Andrade, University of Arizona, PI) [pending]*

2023-2026 "Harnessing the microbiome to improve nitrogen use efficiency and nitrogen recommendations", USDA NIFA-AFRI// \$188,534 total (\$56,560 Indirect Cost) – 1% paid effort, co-PI (Christopher Graham, South Dakota State University, PI;)

2022-2025 "SitS: Linking Soil Biogeochemical Signals to Identify Key Shifts in Carbon and Nitrogen Dynamics on Field Spatial and Temporal Scales Fitting Agricultural Production Systems", National Science Foundation-SitS// \$480,000– 1% paid effort, co-PI (Pedro Andrade, University of Arizona, PI; Albert Barberan, University of Arizona, co-PI)

2022-2024 "Can Cover Crops Mitigate Soil Variability for Iceberg Lettuce Production?", USDA Arizona Department of Agriculture// \$48,372 (\$0 Indirect Cost) – 1% paid effort, PI (Pedro Andrade and Ayman Mostafa, University of Arizona, co-PIs)

2022-2024 "Does Soil Health in Spinach Production Systems Depend on Cover Crops?", USDA Arizona Department of Agriculture// \$48,372 (\$0 Indirect Cost) – 1% paid effort, PI (Joseph Blankinship and Robert Masson, University of Arizona, co-PIs)

2022-2024 "Evaluating Organic Tepary Bean Rotations for Soil Health Benefits", USDA Arizona Department of Agriculture// \$48,544 (\$0 Indirect Cost) – 1% paid effort, PI (Pedro Andrade, University of Arizona, co-PI)

2023-2027 "Evaluating Integrated Water and Nutrient Management Approaches for Climate-Smart Alfalfa Production Systems in Low Deserts of Southwestern United States", USDA NRCS Partnerships for Climate-smart Commodities// \$3,110,590 total (\$ 1,603,968 Indirect Cost) – 12% paid effort, PI (Ayman Mostafa, University of Arizona, co-PI)

2022-2025 "A Novel Cultural Biocontrol Approach for Alfalfa Aphid's Integrated Pest Management in Southwest Low Desert", USDA NIFA// \$139,429 (\$59,755 Indirect Cost) – 2% paid effort, PI (Ayman Mostafa, University of Arizona, co-PI)

2023-2026 "Assessing Regional Soil Health at High Spatial Resolution under Low Carbon Desert Agricultural Production Systems in Building Climate Resilient Systems", USDA NIFA-AFRI// \$729,844 total (\$162,640 Indirect Cost) – 4% paid effort, PI (Pedro Andrade, University of Arizona; Prasad Bandaru, USDA-ARS; Clinton Williams, USDA-ARS, co-PIs)

2022-2025 "Identifying Soil Health Needs in Urban Agroecosystems of United States Southwestern Low Deserts", USDA NRCS// \$295,553 total (\$26,868 Indirect Cost) – 2% paid effort, PI (Jay Subramani, University of Arizona, co-PI)

2023-2027 "Scaling a Proven, Nature-based Solution for Soil Health and Climate Resilience", USDA NRCS Partnerships for Climate-smart Commodities// \$300,814 total – 1% paid effort, PI (Joseph Blankinship, University of Arizona, co-PI)

2023 "Does Cover Crop Choice Affect Water Productivity, Cotton Uniformity, and Soil Health in Cotton Production Systems Under Deficit Irrigation Regime?", Cotton Incorporated-Arizona Cotton Growers Association// \$19,670 total (\$0 Indirect Cost) – 0% paid effort, PI (Elbert Norton, University of America; Kelly Thorp, USDA-ARS, co-PIs)

2022-24 "Novel approach to assess soil health in irrigated winter vegetable production systems of the US Low Desert at high spatiotemporal resolution" USDA AZDA AMS-SCMP// \$175,602 total – 1% paid effort, co-PI (Pedro Andrade, University of Arizona, PI; Daniel Geissler, University of California; Jairo Diaz, University of California, co-PIs) 2023-2026 "Sustaining Soil Health and Productivity: A Novel Approach Using Nitrogen-Containing Co-Crystal Fertilizers", USDA NIFA-AFRI// \$148,436 total (\$42,999 Indirect Cost) – 3% paid effort, co-PI (Jonas Baltrusaitis, Lehigh University, PI; Clinton Williams, USDA-ARS; Blaire Steven, University of Connecticut, co-PIs)

2023-27 "Effects of water conservation practices on sustainable arid lands agricultural production", USDA NRCS-CIG// \$1,376,585 total – 12% paid effort, co-PI: Soil Health and Biogeochemistry Lead (Stephanie Slinski, PI; Pedro Andrade-Sanchez; George Frisvold; Charles Sanchez; University of Arizona, co-PIs)

2023-2026 "Pulses: A Key to Climate Change Adaptation and Agricultural Sustainability in the Southwestern USA", United States Department of Agriculture - Western Sustainable Agriculture Research and Education//\$64,569 total (\$6,457 Indirect Cost) – 0% paid effort, University of Arizona Lead - PI (Jose Luis Dias, University of Arizona, co-PI)

2023-2026 "Sustainable Optimization of Irrigation and Nitrogen Application to Improve Water Productivity and Soil Health in Desert Cotton Production Systems", United States Department of Agriculture - Western Sustainable Agriculture Research and Education//\$106,708 total (\$10,671 Indirect Cost) – 1.5% paid effort, co-PI (Elbert Norton, University of Arizona, PI; Kelly Thorp, USDA-ARS; George Frisvold, University of Arizona; Jay Subramani, University of Arizona; Charles Sanchez, University of Arizona, co-PIs)

2023-2026 "Transformative Change in Arizona Orchard Production Systems through Use of Weed Electrocution Methods", United States Department of Agriculture - Western Sustainable Agriculture Research and Education//\$52,451 total (\$5,245 Indirect Cost) – 2.5% paid effort, co-PI (Jose Luis Dias, University of Arizona, PI; Joshua Sherman, University of Arizona, co-PI)

Before Current Position

2021-2023 "Evaluating Selected Soil Health Indices for Predicting Nitrogen Fertilizer Requirement for Winter Wheat in Western South Dakota", South Dakota Nutrient Research and Education Council// \$37,879 total (\$0 Indirect Cost) – 10% paid effort, co-PI (Christopher Graham, South Dakota State University, PI)

VOLUNTEER SERVICES

Scientific Journal Peer Review Committee

Agronomy Journal (ASA)

Field Crops Research Agronomy for Sustainable Development Land Degradation and Development European Journal of Agronomy European Journal of Soil Science PLoS ONE Agrosystems, Geosciences & Environment Agronomy Applied Science Sensors Journal of Environmental Biology Journal of Soil and Sediment