



Research Programs - II

A Message from the Chair - K. Ramesh Reddy

Current research in the Soil and Water Sciences Department (SWSD) addresses critical soil, water, and environmental issues related to sustainable production (food, fiber, and fuel), water quality, water conservation, soil quality, carbon sequestration, greenhouse gas emissions, and public health. Successful research programs require faculty creativity, innovation, and flexibility to capture unexpected opportunities and to address current needs and future challenges.

The statewide network of SWSD faculty are currently involved in several aspects of soil, water, and environmental issues and are working closely with other disciplines and state agencies through teaching, research, and extension programs. To address these complex inter-related issues, the SWSD research programs are developed in an interdisciplinary format by maintaining disciplinary strength. The SWSD faculty actively collaborate with researchers in other UF departments and other universities and with state and federal agencies by offering complementary programs. This newsletter is second in a two-part series that includes a few examples of our current research activities.

Thus far, 2016 has been a stellar year for SWSD and IFAS. With the support of the Florida Legislature and using some internal resources, the IFAS administration under the leadership of Dr. Jack Payne, senior vice president for agriculture and natural resources, released 75+ faculty positions to improve the technical capacity in teaching, research, and extension. I have never seen this much excitement during 37 years of my tenure in UF/IFAS. The SWSD received 11 of those faculty positions to fill in several gaps created through retirements and expand programs in emerging areas. In addition, we welcome Dr. Pedro Sanchez, a pre-eminent soil scientist, a World Food Prize Winner and a National Academy Member, to our department. Pedro was hired by IFAS as a part of the UF pre-eminent faculty recruitment program. On behalf of the SWSD faculty, I would like to express my sincere thanks to our SVP Jack Payne and the deans (Jackie Burns, Nick Place, and Elaine Turner) for their unprecedented support of statewide soil and water sciences programs. All new faculty members are featured in our newsletters, including our spring newsletter and this one.

Department Name Change

For the past several years our department has been very active in conducting teaching, research, and extension programs in soil and water sciences. To reflect our current activities and our long-term goals, our name is officially changed to:

Soil and Water Sciences Department

Nuisance Algal Blooms: Causes and Consequences in the Northern Indian River Lagoon, Florida

P.W. Inglett lab group (J.R. Papacek, X. Liao) with St. Johns River Water Management District

The Northern Indian River Lagoon, a subtropical estuary in eastern Florida, is experiencing nuisance algal blooms at an increasing rate, including the unprecedented superblooms in 2011 and 2015-16. In a project funded by the St. Johns River Water Management District, we are using stable isotopes and tracers to investigate how levels of nutrients (N and P) and organic forms (DON, DOP and DOC) and uptake kinetics of bloom-forming species may be triggering and sustaining these blooms. We are also using isotope labeling and nutrient and



gas flux measurements to see what proportion of nutrients from the algal biomass return to the water column and potentially feed back to additional blooms. Results of this work are allowing us to not only interpret how past conditions may have triggered superblooms, but also determine whether the system is now more susceptible to these types of events in the future. For additional information, contact Patrick Inglett at: pinglett@ufl.edu.



Unaccounted for Subsoil Carbon in the Southeastern United States

Earth's carbon cycle is closely related to climate change. Accordingly, scientists from a variety of disciplines, land managers, and even policy makers strive to holistically and comprehensively account for Earth's carbon in the hopes of forecasting and combating climate change. The Environmental Pedology and Land Use laboratory is studying a massive and essentially unaccounted for carbon pool that exists deep belowground in the Atlantic Coastal Plain of the southeastern United States, referred to as the "B'h horizon" (Figure 1).

Unprecedented regional analyses (from Lake Okeechobee to Virginia) by M.S. student Yaslin Gonzalez demonstrates that (1) on average B'h horizons contain nearly 70 Mg carbon per hectare, more carbon than any other mineral soil horizon in the region, and even more carbon than the top meter of permafrost soils, (2) the depositional history of the Atlantic Coastal Plain allows us to predict where on the landscape B'h horizons exist, and (3) soils with B'h horizons are extensive, potentially covering more than 20,000 square kilometers. To our knowledge Yaslin's work is the first attempt to reconcile the distribution and carbon contents of the B'h horizon in the Atlantic Coastal Plain, and a major focus of the Environmental Pedology and Land Use laboratory in the coming years will be to further improve regional carbon budgets through investigations of the B'h horizon's origin,



Figure 1. An exposed soil profile in North Central Florida reveals the B'h horizon deep below the Earth's surface.

extent, and response to contemporary human activities on Earth's surface. For additional information contact Allan Bacon at: allan.bacon@ufl.edu and Willie Harris at: apatite@ufl.edu.

Environmental Chemistry and Toxicology

Research within the Environmental Chemistry and Toxicology program focuses on determining the fate and effects of organic pesticides and emerging contaminants in the environment. Current fate studies are evaluating the influence of organic carbon content in sediments on the fate of aquatic herbicides, the potential use of floating wetlands for removing emerging organic contaminants and pesticides from contaminated surface water, and factors influencing losses of pesticides in runoff water at ornamental plant nurseries.

Other studies focus on ecological risk assessments for pesticides in the environment, as well as the uptake and fate of emerging contaminants into fruit and vegetables irrigated with reclaimed water. Toxicology studies focus on determining potential interactions of multiple contaminants/stressors during organism exposures using algae and duckweed as surrogate aquatic plants.

Future research will focus on determining potential contamination of springs and estuaries, as well as possible



causes for mass losses of submerged aquatic vegetation in these systems. For additional information contact Chris Wilson at: pcwilson@ufl.edu.

Everglades Stormwater Treatment Areas

Moving water south, especially into the Everglades Protection Area (EPA), requires adherence to stringent water quality standards, especially phosphorus loads. The largest source of P and other nutrients to the EPA is the Everglades Agricultural Area (EAA). The Everglades Forever Act (EFA) mandates implementation of BMPs followed by monitoring to assess the effectiveness of source control programs to achieve required phosphorus loads.

Since 1994, significant efforts have been initiated by the South Florida Water Management District (SFWMD) and other agencies to reduce the phosphorus loads from the EAA, the state's primary source of sugarcane and winter vegetables. As a part of this effort, approximately 57,000 acres of Stormwater Treatment Areas (STAs) adjacent to the EAA are constructed to reduce phosphorus loads downstream. Some of these STAs have been in operation since 1994.

The SWSD faculty have been actively involved in providing some of the technical background needed to develop these programs. The SFWMD and other agencies developed a Science Plan for the Everglades STAs to



investigate critical factors that regulate the sustainable removal of phosphorus for these treatment systems. The UF research team (Rupesh Bhomia, Stefan Gerber, Kanika Inglett, Patrick Inglett, Todd Osborne, Alan Wright, and Ramesh Reddy) in collaboration with SFWMD scientists are conducting research to address some of key questions related to this program.

For additional information contact K. Ramesh Reddy at: krr@ufl.edu.

Current and former students, faculty, staff and departmental affiliates: Join the department's new LinkedIn group, "University of Florida Soil and Water Sciences Department," to network with and learn from fellow alumni and students: <https://www.linkedin.com/grp/home?gid=8390114>.



Pedro Sanchez Joins the SWSD Faculty

Prior to joining UF/IFAS, Pedro Sanchez served as the Director of the Agriculture and Food Security Center and Senior Research Scholar at Columbia University's Earth Institute. He served as Director General of the World Agroforestry Center (ICRAF) headquartered in Nairobi, Kenya from 1991-2001, as co-chair of the United Nations Millennium Project Hunger Task Force from 2002 - 2005, and as director of the Millennium Villages Project from 2004 - 2010. Sanchez is Professor Emeritus of Soil Science and Forestry at North Carolina State University, where he was in the faculty from 1968-1991 leading the Tropical Soils Research Program. He has lived in Cuba, the Philippines, Peru, Colombia and Kenya, and supervised research programs in over 25 countries of Latin America, Southeast Asia, and Africa.

Sanchez has written groundbreaking books on tropical soil science and hunger and has received honorary Doctor of Science degrees from the Catholic University of Leuven (Belgium), Guelph University (Canada), Ohio State University and North Carolina State University. He has over 200 publications (including 9 in Science and Nature as first author). He is a fellow of the American Association for the Advancement of Science, American Society of Agronomy, Soil Science Society of America and honorary member of the Cuban, Peruvian

and Colombian Societies of Soil Science. Sanchez was anointed Chief by the Luo in western Kenya with the name of Odera Akang'o, and by the Ikaram of southern Nigeria with the name of Atunluse. He is the 2002 World Food Prize laureate, a 2004

MacArthur Fellow, and was elected to the American Academy of Arts and Sciences in 2008 and to the National Academy of Sciences of the United States in 2012. At his induction, Ralph Cicerone, president of the National Academy, summarized why Pedro was elected a member: "Sanchez has led path-breaking research on soil management for improved food production in the tropical world. His work has influenced research in agronomy, ecology, and changed the way technology is used to increase food production."

For additional information contact Pedro Sanchez at pedrosanchez@ufl.edu.



Urban Water Quality

Water quality research in urban ecosystems is needed to protect and preserve urban waters for human and ecosystem needs. Our ongoing research is investigating the sources, drivers, mechanisms, fate, and transport of carbon, nitrogen, and phosphorus from urban residential neighborhoods to stormwater retention ponds and connected surface water bodies. In this research, we are coupling chemical methods with advanced techniques such as stable isotopes of carbon, nitrogen, and phosphorus; nuclear magnetic resonance (NMR) spectroscopy; and Fourier transform ion cyclotron resonance mass spectroscopy (FTICRMS). This work is being done with collaborators from other universities and national labs. These projects will generate data to formulate science-based policy decisions and reduce incidences of algal blooms in urban waters.

In this picture, stormwater runoff from a residential neighborhood enters storm drains and is carried to a stormwater pond, where we are using auto samplers, flow meters to collect runoff samples and determine flow. The



picture shows (from left to right) graduate students Sinan Asal (MS), Jariani Jani (PhD), and Stefan Kalev (MS) at one of the sites (missing in the picture are MS graduate student Gurcan Baysal and postdoctoral researcher Yun-Ya Yang). For more information contact Gурpal Toor at: gstoor@ufl.edu.

Background Concentrations of PAHs in Florida Urban Soils

Polycyclic aromatic hydrocarbons (PAHs) are persistent organic contaminants exhibiting carcinogenic toxicity. The presence of PAHs, especially benzo(a)pyrene, in soils and solid wastes is of environmental concern in Florida as well as in the US.

Our overall objective is to establish a comprehensive database on the background concentrations of PAHs in Florida urban soils. We plan to review literature on soil background concentrations of PAHs, collect representative urban soil samples from major cities in Florida, analyze total concentrations of 16 PAHs in soils, identify PAH sources based on their molecular weights and molar ratios, and compare PAH concentrations to soils in other states and solid wastes in Florida.

For more information, please contact Lena Ma at: lqma@ufl.edu.



Peng Gao, Evandro B. da Silva, and Leo J. Moreira, Ph.D. students doing soil sampling in Orlando.

Welcome New Students Fall 2016!

PhD

Ibukun Timothy Ayankojo (Morgan)
 Tiantian Li (Li)
 Conor MacDonnell (P. Inglett)
 Sara Miller (Osborne)
 Katsutoshi Mizuta (Grunwald)
 Dipti Rai (P. Inglett)
 Saroop Sandhu (Gerber)
 Tracey Schafer (Reddy)

MS

Cassandra Bonds (Mylavarapu)
 Jay Capasso (Bhadha)
 Gaia Fisher (Wright)
 Brandy Foley (Wright)
 Jay Gilbert (Osborne)
 Yaslin Gonzalez (Bacon)
 Caleb Gravesen (O'Connor)
 John Hamilton (Osborne)
 Luke Harlow (Mackowiak)
 Laura Jalpa (Mylavarapu)
 Selly Kharisma (Bacon)
 Gabrielle Lawson (Wilkie)
 Kaitlyn Mroczka (Osborne)
 Julio Pachon (Bacon)
 Kaylee Rice (P. Inglett)
 Kyle Richards (Bhadha)
 Taylor Smith (Reddy/Wright)
 Jennifer Trevis (Reddy)
 Shiji Wang (He)

BS - IS-EMANR (Advisor - Curry)

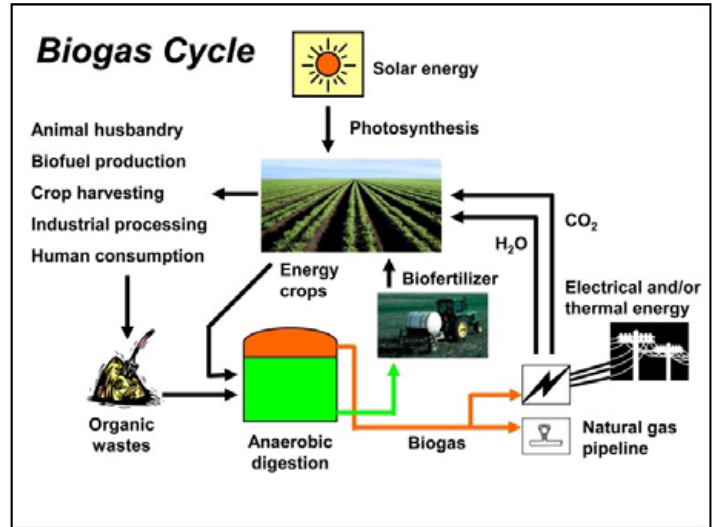
Kristen Albritton
 Ishmael David Ali
 Kendale Antoine
 Rachel Barthle
 Aimee Cho
 David Dalton
 Donielle Donley
 Angela Echeverry
 Alexander Fast
 Alexandra Frezer
 Benjamin Grubbs
 Aaron Guillory
 Leigha Heverly
 Robbin Huffines
 David McDaniels
 Aaron Moesching
 Courtney Murphy
 Ashley Nicolls
 Olivia Real
 Domenica Santana
 Matt Stephenson-Smith
 Michael Tintner
 Adam Yingling
 Kellie Zambito

Bioenergy and Sustainable Technology

Waste is not waste until it is wasted!

This program includes research on: 1) the practical application of anaerobic digestion for waste treatment and renewable energy production from biomass and organic residues, including livestock waste, food waste, bioethanol and biodiesel by-products, and other waste streams, and 2) phycoremediation of wastewaters using indigenous algae.

Recent projects include: diverting food waste from landfills for biogas and fertilizer production; bioprospecting and cultivation of oleaginous algae for biofuel production, bioremediation of wastewaters, and carbon capture and utilization; and growing energy crops for biofuel and biogas production.



The Biogas Cycle

For additional information, contact Ann Wilkie at: acwilkie@ufl.edu.



Cultivation of algae on landfill leachate.

Hui-Ling Liao Joins the SWSD Faculty

Hui-Ling Liao received a B.S. and M.S. from National Chung Hsing University and National Taiwan University and Ph.D. from the University of Florida. Hui-Ling worked as a postdoctoral research associate at the Citrus Research and Education Center (CREC) - UF/IFAS and Mycology lab at Duke University. At CREC, her research program focused on understanding the metabolic aberrations of citrus in response to the pathogenic microbes. At Duke, she participated in the research programs on continental-scale of soil microbe and pine interactions. In addition to answering many exciting questions regarding genetic diversity and host specificity of symbiotic microbes, she enjoyed walking with the ecologists in the natural forests to collect mushrooms.

Hui-Ling joins North Florida Research and Education Center, Quincy, Florida, as an Assistant Professor in Soil Microbial Ecology. She plans to develop innovative strategies (e.g., metaomics) to profile the functional diversity of environmental microbes in situ. Results



of her studies will be applied to visualize the impacts of microbe-plant-soil interactions on natural/agro-ecosystem function. Her extension efforts focus on the ecosystem services underlying natural and farming systems. For additional information contact Hui-Ling Liao at: sunny.liao@ufl.edu.

Matthew Deitch Joins the SWSD Faculty



Matthew Deitch joins the Soil and Water Sciences Department as an Assistant Professor in Watershed Management at the West Florida Research and Education Center, Milton. After completing a PhD and post-doc at the

University of California, Berkeley in 2008, Matthew directed a hydrology program for a nonprofit environmental science firm, where he partnered with regulatory agencies and agricultural producers to devise water management practices to meet agricultural needs and maintain environmental uses.

His research interests include water management at reach- and catchment-scales and cumulative effects of small spatially distributed water projects on streamflow, as well as how science can inform policy to advance sustainable water resource management. His research has been used to develop new policies and practices to improve aquatic ecosystem sustainability in his primary study area.

For additional information contact Matt Deitch at: mdeitch@ufl.edu.

Integrated Farmer Participatory Watershed Management Program

University of Florida/IFAS and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) have developed strong collaborative partnerships. ICRISAT is located in Hyderabad, India. As a part of this program, UF/IFAS faculty in collaboration with ICRISAT scientists are involved in various educational and research activities. This includes graduate students conducting part of their research at ICRISAT.

This summer Claire Friedrichsen (Samira Daroub - Advisor) spent six weeks at the ICRISAT to conduct her dissertation research on extension communication in the Integrated Farmer Participatory Watershed Management Model (IFPWM). IFPWM was developed by Dr. Suhas P. Wani and has been implemented in over 300 watersheds across Asia with the goal of improving livelihoods.

Claire focused her research on a watershed that is facing soil and water quality problems due to urbanization. She collected data in order to create mental models of farmers, extension agents, and scientists of how soil



and water management relates to the community's food security. For additional information, contact Claire Friedrichsen at: cfriedrichsen@ufl.edu.

Congratulations Summer 2016 Graduates!

MS

Ibukun Ayankojo (Morgan)
 Kenneth Henderson (Li)
 Randall Martin (Ma)
 Shanyu Meng (Li & Tong)
 Katsutoshi Mizuta (Grunwald)
 Matthew Nance (Wilson)
 Tipanun Upanisakorn (O'Connor)
 Stephanie Wester (P. Inglett)
 Ashley Witkowski (Daroub)

BS - IS-EMANR (Advisor - Curry)

Yaslin Gonzalez

SWS Minor (Advisor - Bonczek)

Bertha Castellanos
 Yaslin Gonzalez
 Heather Rountree
 Melonie Sterling

Faculty, Staff and Students

Congratulations to our faculty and students for their outstanding accomplishments:

Ann Wilkie was selected to receive the 2016 Joye Giglia Endowment for Innovative Agricultural Technology Award.

SWSD Excellence in Graduate Studies Award

PhD Level: Biswanath Dari (Nair & Mylavarapu) and Debjani Sihi (P. Inglett)

MS Level: Hamza Keskin (Grunwald)

CALS Scholarship Winners for 2016-2017

Environmental Management in Agriculture and Natural Resources - Undergraduate (Curry):

Doris Lowe and Earl and Verna Lowe Scholarship:
 Stephanie Fisher, Haley Glaab and Chelsea Hazlett

Florida Rural Rehabilitation Corporation, Inc. Scholarship (Off-Campus): Sara Harper

Soil and Water Sciences - Graduate:

Doris Lowe and Earl and Verna Lowe Scholarship:
 Ryan Blaustein (Teplitski), Andree George (Teplitski), Marcos Moraes (Teplitski) and Elise Morrison (Ogram)

William C. and Bertha M. Cornett Fellowship: Christopher Clingensmith (Grunwald)

Spring 2016 Undergraduate Academic Achievements

Dean's List - Sara Baker, Katie Galluscio, John Michael Santiago (Bonczek)

Join us at...

The 17th Annual Soil and Water Sciences Research Forum

The 17th Annual Soil and Water Sciences Research Forum will be held September 15, 2016, in Gainesville, Florida. The forum is designed to bring together representatives from state and federal agencies, private industry, faculty, graduate students, and prospective students interested in soil and water sciences. The forum will provide an opportunity for all those interested in soil and water sciences to interact with our students, faculty, and administrators on campus.

Our Keynote Speaker will be Dr. Pedro Sanchez, Research Professor at the Institute for Sustainable Food Systems and the Soil and Water Sciences Department. He will be speaking on *Africa's Progress in Fighting Hunger: Science and Policy*. We look forward to your participation in the forum. If you are planning to attend, please register at <http://soils.ifas.ufl.edu/research/research-forum/2016-sws-research-forum/>.

For additional information, contact James Jawitz at: Jawitz@ufl.edu.

Myakka (pronounced 'my-yak-ah' – Seminole word for "big waters") gives a special identity to our department, as it is also the name of Florida's State Soil, Myakka fine sand. The State of Florida has the largest total acreage of Myakka fine sand (sandy, siliceous, hyperthermic Aeric Alaquod) on flatwood landscapes.



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