



Myakka

A Soil and Water Science Department Publication



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Institute of Food and Agricultural Sciences

Summer 2002

Featuring
SWSD Thrust Area:

WASTE MANAGEMENT



At the Dairy Research Unit



Constructed wetlands for dairy effluent treatment



Land application of biosolids

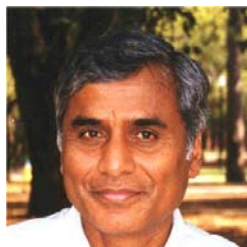
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Visit the SWS website:
<http://soils.ifas.ufl.edu>



From the Chair...



Land application of non-hazardous wastes such as agricultural, industrial, and municipal wastes as a source of nutrients for crop production is becoming a common

practice throughout the world. The cost-effectiveness and environmental impact of utilizing wastes continues to be a volatile issue. In the state of Florida, land application of wastes is a special concern because of the poor nutrient retentive capacity of sandy soils and the fragile nature of nutrient sensitive aquatic ecosystems. The animal industry's sustainability in Florida depends on optimal management of wastes while preventing the contamination of water resources. In this current newsletter, we focus the statewide research and education efforts of the Soil and Water Science Department on management of wastes, with special emphasis on land application and water quality. Here are a few examples:

- We conducted research, and cooperated with scientists and regulators nationwide, to develop numerical standards for molybdenum (Mo) in biosolids that provide beneficial reuse of biosolids while protecting against molybdenosis.
- Pressure is growing to limit waste applications (e.g., manures, biosolids, composts) to land based on the phosphorus content of the waste. Such guidelines threaten to severely limit waste utilization on land. Our research has shown that not all phosphorus in wastes is equally available and that normal waste application rates are possible without water quality degradation.
- Our research has shown that amending soils with water treatment residuals can increase soil retention of phosphorus and dramatically reduce its leaching potential.
- Management practices to protect groundwater from nitrate contamination have been demonstrated for dairy, poultry, and

row crop farms in the Suwannee River Basin. Groundwater beneath these farms is being monitored to confirm the effectiveness of these practices

- A demonstration-scale fixed-film anaerobic digester at the IFAS Dairy Research Unit is serving as a model for the Florida dairy industry. This system treats flushed dairy manure, controls odors, produces renewable energy (biogas) for on-farm use, minimizes environmental impact from waste emissions, and maximizes fertilizer and water recovery for reuse.

- We are now investigating the potential contamination of agricultural drainage waters with natural steroidal estrogen hormones (particularly 17 β -estradiol and estrone) when manure is land-applied at conventional agronomic rates.

As we all know, the fiscal year of 2002-03 started with severe budget cuts. This has limited our ability to serve our clientele effectively. Our faculty, staff, and students had a busy summer and here are few highlights of their activities.

- Soil and Water Science Institute offered two short courses: Hydric Soils (Wade Hurt and Willie Harris), and GIS Applications in Soil and Water Science (Sabine Grunwald)
- 3rd Annual Soil and Water Science Research Forum was held on September 5, 2002. Graduate students presented 10 oral and 40 poster presentations. Several funding agency representatives participated in the forum.
- Our faculty, in collaboration with the Agricultural and Biological Engineering and Environmental Engineering Sciences departments, initiated a major research and extension initiative in the Okeechobee Drainage Basin to address water quality issues related to animal industry.

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Teaching

NEW GRADUATE STUDENTS

Summer 2002

Dara Park 2002

GRADUATES

Summer 2002

Katie Barch, M.S., Advisor, J.R. White

Mayumi Seo, M.S., Advisor, K.R. Reddy

Several new courses are now approved for future offering:

SOS 4245 Water Resource Sustainability
 SOS 4720C GIS in Soil and Water Science
 SOS 5242 Wetland and Water Quality (Distance education only)
 SOS 5245 Water Resource Sustainability
 SOS 5050C Soils for Environmental Professionals
 SOS 5720C GIS in Land Resource Management
 SOS 6456 Advanced Biogeochemistry

Two Alumni Graduate Fellowships were awarded to the department. Recipients of these fellowships are: Lynette Malecki (John White, Advisor) and Rex Ellis (Mary Collins, Advisor). So far, we received a total of 7 alumni fellowships. Distance Education Graduate Program is gaining momentum. We have 20 students enrolled in our distance education classes. Two graduate student applications are approved for M. S program via distance education. Details about the program can be obtained from Sabine Grunwald, Distance Education Coordinator, SGrunwald@mail.ifas.ufl.edu or http://disteduc_sws.ifas.ufl.edu/

The 3rd Annual Soil and Water Science Research Forum was held on September 5, 2002. Graduate students presented 10 oral and 40 poster presentations. The forum was attended by approximately 150 people. Several funding agency representatives participated in the forum. Thanks to our dedicated graduate student Nadine Kabengi for her work in organizing the forum.

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The Soil and Water Science Department (SWSD) along with other UF-IFAS departments and centers went through some serious budget cuts and the new fiscal year started with significant reductions in operating funds and support staff. We are facing severe reductions in faculty FTEs as a result of retirements and faculty leaving for other positions. Our faculty numbers will be reduced by as much as 30% by the end June 2003. We are hopeful some of these positions will be restored. These are challenging times for all of us, especially for our department. In spite of these faculty reductions, our grant activity and graduate student enrollment is at an all time high. This is a clear evidence of the quality of faculty in the department. We will continue to find creative ways to effectively serve our clientele effectively. To our alumni and friends of Soil and Water Science Department, we need your help and support during these critical times. So please send your creative ideas for us to function better and more effectively.



FACULTY, STAFF, and STUDENTS

Mary Collins was elected as Division Chair for S-5, Soil Science Society of America.

Ann Wilkie was appointed to the Scientific Advisory Panel of Dairy Farmers, Inc., in August 2002. Ann also serves as a technical advisor to the Environmental Committee of the National Pork Board.

Ron Corstanje, Patrick Inglett, Konstantinos Makris, Monika Tkaczyk, and Kanika Sharma received best paper awards at the 3rd Annual SWS Research Forum.

Raymond Snyder received the First Place Award for a paper he presented at the Florida Turfgrass Association meeting held in Tampa during September. The title of his presentation was 'Investigation of Coated Sands Used in Putting Green Construction'.

International Activities

The SWSD was well represented by our faculty at the World Congress of Soil Science held in Bangkok, Thailand from August 14-21, 2002. Various thrust areas were represented by Dave Calvert, Zhenli He, Vimala Nair, George O'Connor, Andy Ogram, Ramesh Reddy, and George Snyder. Ramesh Reddy also presented an invited paper at the VIII International Congress of Ecology (August 10-14, 2002), Seoul, Korea.

Peter Nkedi-Kizza taught a three-week course (Fate of Pesticides in Tropical Soils) in Uganda, at Makerere University. Twelve graduate students in chemistry from four African countries (Uganda, Kenya, Tanzania, and Ethiopia) attended the course from June 26 -August 5, 2002. Makerere University is a partner with UF through a cooperative agreement that was signed in 1989. The students in the course were sponsored by the African Network for Chemical Analysis of Pesticides (ANCAP). This was the first course in what is planned as an annual event to be held in a different country each year.

International Conference "Sustainable Land Application" January 4-8, 2004, Wyndham Palace Resort and Spa, Lake Buena Vista, Florida

The University of Florida-IFAS is planning to host an international conference entitled "Sustainable Land Application." The conference will address soil reactions of constituents in biosolids, effluents, manures, and other non-hazardous wastes. A basic premise of the conference is that waste constituent reactions in soils depend much more on the soil, and basic biogeochemical reactions therein, than on the waste itself. Focusing on fundamental reactions, rather than specific wastes, is likely to promote environmentally friendly management of wastes in a sustainable manner. The conference will be **science-based** to avoid the appearance of bias. We expect the conference to have wide appeal, and to attract a minimum of 300 participants. The conference venue is Lake Buena Vista (Orlando), FL at a Disney property (Wyndham Hotel and Spa). For additional information contact the conference chair: George O'Connor at: gao@ufl.edu or visit the conference website at: <http://conference.ifas.ufl.edu/landapp>.

Research

Animal Waste Management: Technology for Odor Control, Energy Production and Nutrient Recovery

The increase in production and concentration of intensive livestock operations along with increased urbanization of rural regions have resulted in greater awareness and concern for the proper storage, treatment, and utilization of livestock wastes. Anaerobic digestion can offer a beneficial option for livestock waste management. In anaerobic digestion, nutrients are conserved, odors, flies and pathogens are reduced, and greenhouse gas emissions are eliminated, while a significant amount of energy is recovered in the biogas.

In Florida, the use of large volumes of flush water for dairy manure collection means that conventional anaerobic digestion, using complete-mix or plug-flow technologies, is neither practical nor economical, due to the dilute nature of the manure streams. A full-scale demonstration fixed-film anaerobic digester was built and is in operation at the University of Florida's Dairy Research Unit (DRU) in Hague, Florida. This unique anaerobic digester design allows biogas recovery from the liquid portion of flushed dairy manure at ambient temperature conditions.

The DRU fixed-film biogas digester is partially filled with media, which provides a large surface area for bacterial attachment. This enables stable biogas production at low hydraulic retention

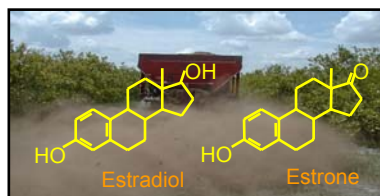


Fixed-Film Anaerobic Digester designed by Ann Wilkie

times (<3 days) even at low ambient temperature conditions (<20 °C). The DRU fixed-film biogas digester demonstrates the application of fixed-film anaerobic digestion to the treatment of flushed dairy manure at a working dairy under field conditions. About half of the solids in the flushed dairy manure are removed during pretreatment by mechanical separation and sedimentation. Currently, a local certified organic farm is using the separated solids from the DRU in vegetable production after a suitable curing period. For additional information, contact Ann Wilkie, acwilkie@mail.ifas.ufl.edu

Steroidal estrogen hormones in livestock manure as potential environmental contaminants

Recent literature has indicated that agricultural drainage waters may become contaminated with natural steroidal estrogen hormones, particularly 17 β -estradiol and estrone, when dairy or poultry manure is land-applied at conventional agronomic rates. The loading of estrogens to waterways is of scientific and regulatory concern because there is good evidence that low part per trillion (ng L⁻¹) concentrations of these chemicals in water can adversely affect the reproductive biology of aquatic vertebrates (fish, turtles, frogs, etc.) by disrupting the normal function of their endocrine systems. High concentrations of estrogens have been reported in manure-impacted surface runoff, ponds, streams, and groundwater. In several cases, the concentrations of 17 β -estradiol alone were more than an order of magnitude higher than the concentrations typically associated with



Application of poultry manure to a citrus grove

endocrine disruption phenomenon in fish and wildlife. Goals of our research are to survey concentrations of estrogens in poultry wastes and investigate the fate of 17 β -estradiol and estrone in poultry waste-impacted soils. Results of this study help clarify the potential environmental risk associated with estrogen hormones in poultry manure.

For additional information contact D.A. Graetz, dag@mail.ifas.ufl.edu

Land Application of Biosolids: Phosphorus Considerations



Bahiagrass harvesting from greenhouse studies of biosolids amended soils

Land application of biosolids (municipal sewage sludge treated to reduce pathogen hazards) is common in Florida, especially on pastures. Biosolids contain organic matter and nutrients that are beneficial to the soil-plant system, and application rates are commonly based on crop nitrogen (N) needs. Such rates, however, typically simultaneously supply phosphorus (P) in excess of crop P needs. This can lead to P accumulation in amended soils and the potential for P-related water quality problems if the biosolids-P contaminates surface water bodies. The Water Environment Research Foundation (WERF) funded a two-phase project entitled "Characterizing Forms, Solubilities, Bioavailabilities, and Mineralization Rates of P in Biosolids, Commercial Fertilizer, and Manures" to evaluate the agronomic and environmental impacts of biosolids compared to impacts from P in manure and fertilizer. The research is a cooperative effort of SWS personnel and personnel at Pennsylvania State University.

Phase I of the project focused on laboratory and greenhouse studies of a wide range of biosolids produced via treatment processes used throughout the US, plus 3 manures, and a common P-fertilizer. Most commonly produced biosolids had P availabilities (agronomic impact) about one-half that of P-fertilizer. Biosolids produced via a Biological P Removal (BPR) process, however, contained large amounts of soluble P and P availabilities essentially the same as P-fertilizer. Typically, the susceptibility of biosolids-P to leaching in sandy FL soils (environmental impact) is much less than fertilizer-P or manure-P. BPR biosolids, however, were atypical and resulted in P leaching losses greater than manure, though still less than fertilizer. Biosolids-P availability and susceptibility to leaching is a function of biosolids Fe and Al concentrations. Biosolids naturally high in the metals have reduced agronomic impact and much lower P environmental hazard. Data suggest that co-applying biosolids and water treatment residuals (high in Fe and Al) may ameliorate P leaching concerns.

Phase II of the project began in 2002 and concentrates on field validation of the Phase I results. We will also conduct studies of P susceptibility to runoff losses; such losses are more common than leaching losses in most of the US. For additional information, contact George A. O'Connor, gao@ufl.edu

Extension

Waste Management Issues in Florida

Addressing Florida's waste management issues from the perspective of a statewide extension program can be a difficult task because while a few blanket decisions are made at the state level (e.g., banning horticultural waste from landfills), most decisions are made on a county-by-county basis. As landfill space decreases and biosolids production increases, this traditional way of thinking can lead to poor waste management efficiency. Decisions that county commissions must make include the methods that their county will use to dispose of municipal solid waste, the fate of treated wastewater, and where and how to dispose of biosolids.

In the 1990s, there were many projects sponsored by the Center for Biomass Programs that researched the potential for compost use in Florida. One focus for the waste management extension program will be to educate county commissioners and staff about the pros and cons of composting municipal solid waste so they can make their most informed decisions when plotting the course of future waste management. This plan presents the opportunity to work with the Florida Organics Recycling Center for Excellence (FORCE) in Sumter County. It will be important to reach the decision-makers far in advance of the time when they take action so they can give composting a fair measure against the more traditional waste-disposal methods.

The large majority of biosolids are land applied because ocean dumping is illegal, incinerators are few and far between, and landfill space is shrinking. When the benefits of biosolids application to Florida soils are fully explained to people, only a small minority do not agree that cycling these materials back to the land is the right thing to do. However, it is not uncommon for a small but vocal minority to catch the ear of a few key decision-makers and convince them to make far-reaching decisions that make the relatively simple process of land-applying biosolids a quite difficult one. The recent county rulings in south Florida related to land application of biosolids have taken a "not in my county" approach. The waste management extension program will focus on two areas: the continuing education of the public regarding the benefits of land application, and the education those individuals who are involved in the "visible" portion of biosolids disposal, particularly the haulers and applicators. Even if biosolids have been processed perfectly at the wastewater treatment plant, a single instance of poor hauling (e.g., leaking trucks) or spreading (e.g., over-application) can give the entire industry a bad name. For additional information contact T.A. Obreza, taob@mail.ifas.ufl.edu

Jerry Kidder retires after 27 years of distinguished service with UF-IFAS



Dr. Jerry Kidder with wife, Kathy

Dr. Jerry Kidder began serving as Extension Soils Specialist in the Soils Department in Gainesville. In the early years, his program focused on interpretation of soil tests and the soils aspects of plant nutrition. He promoted standardization of the fertilization recommendations made from UF/IFAS soil tests and accomplished computerization of the Extension Soil Testing Lab's reporting system. He coordinated with research and extension faculty on campus, at research stations, and in counties to test and modify recommendations and fertilization practices. For 15 years, he edited "Highlights in Soil Science," a quarterly publication with short topics directed toward county Extension agents. As environmental aspects of waste and nutrient management became prominent issues, his program emphasis shifted to utilization of wastes on land.

Jerry Kidder received the 1999 Outstanding Specialist award from the Florida Association of County Agricultural Agents. He served as interim chair of the Department for nine months in 1990, and chaired the committee which recommended the establishment of EDIS as the single, electronic source of UF/IFAS Extension publications. He has consulted in Ecuador, Nicaragua, Honduras, Costa Rica, and Oman. In retirement, he plans on continued enjoyment of travel, grandchildren, fishing, genealogy research, some unstructured time, and taking advantage of opportunities that life presents.

New Extension Water Quality Coordinator



Thomas A. Obreza

Dr. Obreza was born and raised in northeast Ohio. He received his B.S. in Agronomy from the Ohio State Univ. in 1978. He attended graduate school at the Univ. of Florida, receiving his M.S. (1980) and Ph.D. (1983) degrees in the Soil Science Dept. His Major Professor for both graduate degrees was Fred Rhoads of the Quincy experiment station.

From 1983 to 1989, he was employed by the Crop Research and Development division of A. Duda & Sons, Inc. He was stationed at Duda's LaBelle citrus operation, where his primary responsibility was applied research in citrus irrigation and nutrition with particular emphasis on micro-irrigation. In 1987, the UF-IFAS Immokalee experiment station was expanded to become the Southwest Florida Research & Education Center (SWFREC), and in 1989 Dr. Obreza was employed as the station's Soil Scientist, replacing the retired Paul Everett. During his 13 years at SWFREC, Dr. Obreza worked on improving nutrient and water management of citrus, vegetable, and sugarcane crops. His main contributions were in the areas of efficient nitrogen fertilization and the management of micro-irrigation systems. In 2002, the opportunity arose for Dr. Obreza to transfer to the SWSD in Gainesville to assume the duties of statewide extension water quality coordinator, a position vacated upon the retirement of Art Hornsby. Dr. Obreza will also serve as the department's overall extension coordinator.