RECYCLING OF NUTRIENTS USING STORMWATER DETENTION SYSTEMS

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"Reduce, reuse, and recycle" is a phrase commonly associated with urban environments. We present the three R's of environmental conservation for agricultural systems in the Everglades basin. The main goal was to design an environmentally and economically sustainable approach to manage the inevitable nitrogen (N) and phosphorus (P) losses from agricultural farms. The approach was a combination of mining nutrients from agricultural stormwater detention systems by harvesting aboveground biomass, composting it to produce organic fertilizer, and farm application of the compost to enhance soil productivity and water and nutrient use efficiencies. Nitrogen losses from the farm could be considerably reduced through harvesting-composting approach. The N retention efficiency of the detention systems was estimated to increase from 68% to 86%. If the cost of composting-harvesting was to be incurred by the State, a positive cash flow of $42,000/year could be achieved considering the 20-year net present worth of the project. For P, harvesting-composting was shown to be an even better approach to capture farm-scale losses. We show that there is an increasing degree of P saturation in aged detention systems which is causing them to transition from a sink to a source of P. Such shifts can have significant consequences for P-limited ecosystems such as the Everglades. Mining "surplus P" is a promising sustainable solution to maintain the sink function of detention systems. Results showed that P retention efficiency could be increased by almost 50% while reducing the P treatment cost by 90%, compared to publicly-funded stormwater treatment systems. A Payment for Environmental Services (PES) approach developed for both N and P treatment, will be presented as a win-win for the producers as well as the state. Water quality and economic analyses results will be compared to an ongoing PES program, using 10-year water quality and economic data.

PRESENTER BIO: Sanjay Shukla is a professor in the Agricultural and Biological Engineering Department at UF. He is a Distinguished Water Institute Fellow, UF Foundation Research Professor and Term Professor. His interests include hydrology and water quality, drainage and irrigation management, and win-win solutions to bring changes in agriculture.