Integrated Drainage-Wetland Systems for Reducing Nitrate Loads from Tile Drained Landscapes

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Abstract
In addition to raising local water quality concerns, nitrate loads from Midwest agriculture are suspected as a primary contributor to hypoxia in the Gulf of Mexico. Over-application of fertilizer can exacerbate the problem, but the major causes are hydrological and land-use changes that came with tile drainage. Subsurface drainage creates very productive croplands and reduces water quality problems associated with surface runoff, but subsurface flow and nitrate transport are substantially increased. A permanent solution to the environmental problem of hypoxia in the Gulf of Mexico will likely require more than improved nitrogen management and tillage practices. We present results of simulations integrating nitrate-removal wetlands, as a proven technology, with the emerging technologies of drainage modification. Relatively small areas of wetlands intercepting tile drainage can remove over 50% of the nitrate in tile drainage water. Controlled drainage and shallow drainage can reduce subsurface flow and nitrate export by as much as 50%. The integration of shallow and controlled drainage systems with nitrate-removal wetlands has the potential to simultaneously decrease the volume of subsurface drainage, increase the number of wetland sites, push those sites closer to the nitrate source, and enhance wetland performance by increasing the average residence time in the wetlands.

Disciplines
Agriculture | Bioresource and Agricultural Engineering

Comments
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