USDA-CSREES 2006 National Water Quality Conference

Drainage Water Management to Improve Water Quality of Discharge from Open Channels that Collect Surface Runoff & Intercept Subsurface Flow

Drainage water management is an emerging technology currently being applied to modify conventional subsurface drainage practices to reduce agricultural nutrient (nitrate-N) loss carried from cropland in subsurface drainage discharge water. It is accomplished through the use of control structures that hold water in the soil profile rather than allow it to freely drain below a predetermined elevation. Nutrient reductions from the implementation of drainage water management is based on two concepts; a nutrient load reduction based on reduced drainage discharge (a volume reduction rather than a reduction in concentration); and an increase in the denitrification potential due to a thicker anaerobic saturated zone within the field due to a higher water table (a reduction in the soil-water nitrate concentration). The combined reduction by these two factors significantly decreases the nitrate load carried from cropped fields under drainage water management to off-site surface waters. Research has confirmed the effectiveness of this technology in reducing subsurface nitrate discharge from subsurface drainage at several U.S. humid region locations. In warmer regions, the practice of holding the water table near the ground surface when no crop is grown (winter months) extends the period for denitrification, thus further reducing total annual loss of nitrate-N from the soil profile.

Drainage water management concepts though can also be applied to surface drainage systems that discharge into field ditches or open channels. Controlling drainage from these field ditches and open channels may have similar benefits of reducing nutrient losses from cropland; however, this concept needs to be researched more extensively before widespread adoption can be recommended. This paper discusses the need for research to quantify the water quality improvements (if any) when drainage water management technology is applied to ditch drainage systems that collect surface drainage waters. Research methods involving field experiments and modeling/simulation are outlined.

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