

**PAPER 12****Implementation and monitoring measures to reduce agricultural impacts on water quality: US experience**

*Dell, C J, Kleinman, P J A, and Veith, T L.*

*USDA-ARS-Pasture Systems and Watershed Management Research Unit, University Park, PA, USA*

*Maguire, R.O.*

*Crop and Soil Environmental Sciences Department, Virginia Tech, Blacksburg, VA, USA*

As European nations move toward compliance with the EU Water Framework Directive, national efforts to manage and regulate agricultural impacts on water quality in the US can provide useful guidance. Concentration of livestock and poultry production in the US has changed the distribution of nutrients and negatively impacted water quality in many major watersheds. While nitrogen losses from agricultural lands have long been a concern, the relatively recent increases in phosphorous (P) losses have accelerated eutrophication of surface waters. The US Environmental Protection Agency (EPA) and cooperating agencies of individual state governments have responded by establishing requirements for nutrient management plans for large animal production operations (>200 animal units). Compliance by smaller farms is normally voluntary, but federal and state governments provide incentives for many best management practices (BMPs) to reduce nutrient and sediment pollution through grants and cost-share programs.

Numerous individual and cooperative research programs have provided the basis for nutrient management guidelines. One example is the National P Project, in which federal and university researchers from across the US established common protocols to monitor and assess P loss potentials under varying land management scenarios. Another cooperative research and implementation program that may be of particular interest to Europe is the Watershed Agriculture Project (WAP) in New York. This project was developed to mitigate excess nutrient and pathogen levels entering agricultural watersheds in the Catskill region that provide drinking water for New York City. As an alternative to spending billions of dollars on additional water filtration facilities, WAP has supported site-specific research and has worked with individual farmers to develop farm-by-farm management plans to control nutrient, sediment, and pathogen export to the watersheds. These comprehensive management plans maintain both environmental protection and farm production by considering factors such as animal feeding strategies, manure management, cover cropping, and stream bank fencing.

To determine if recommended conservation practices are having the intended effect, the US Department of Agriculture (USDA) initiated the Conservation Effects Assessment Project (CEAP) in 2003. The project utilizes past and ongoing monitoring and experimental data to validate prediction models that are, in turn, used to evaluate the impact of adoption of BMPs at the watershed scale. One CEAP activity was the evaluation of conservation measures adopted under WAP guidance in the Cannonsville, NY watershed. Modeling showed a 32% reduction in stream deposition of fecal P from the construction of stream back fencing. Additionally, more accurate feeding of P to dairy herds reduced P losses at the watershed outlet by 10%.

Several challenges remain as the US fully implements agricultural water quality programs including: identifying and addressing pollutant sources within multi-farm watersheds; differentiating agricultural sources from other non-point sources; identifying new technologies to reduce nutrient losses (such as manure injection); and, assessing nutrient losses from grazed lands.