

Assessing the Effects of Conservation Practices and Fertilizer Application Methods on Nitrogen and Phosphorus Loss from Farm Fields – A Meta-Analysis

Synthesize a currently available research to examine the effects of water and soil conservation practices and fertilizer application methods on nutrient loss from farm fields

Dr. Song Qian, Department of Environmental Sciences, University of Toledo

Project dates: January 2014 – December 2015

Project number: 4RM-07

Collaborators: R. Daren Harmel of USDA-Agricultural Research Service. Stephanie A. Nummer, graduate student, University of Toledo



PROJECT GOALS

RATE	Rate of P and loss with and without conservation practices
PLACE	Quantify the effects of fertilizer application methods on the loss of N and P from fields
4R	What are the effects of the implementation of conservation practices on the loss of N and P from fields?

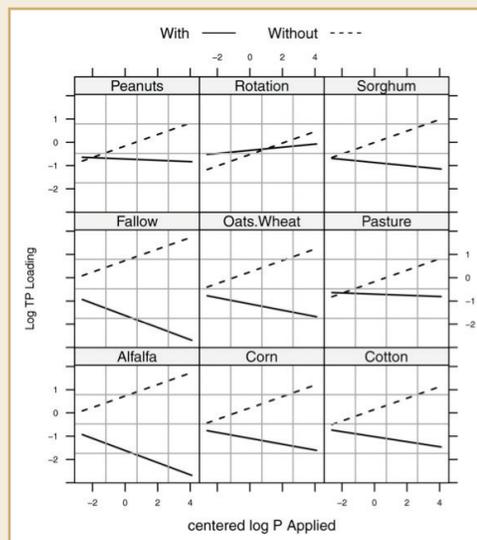
PROJECT RESULTS

The loss of P and N increases with increased P or N application. Incorporation of P is an effective way to decrease P losses. Adding one or more conservation practice reduces total P and N loss by 2/3 and reverses the increased loss of P and N with increased P or N application.

RATE	Increased effectiveness of conservation practices to reduce P loss as P application rate increases.
PLACE	Incorporation of P fertilizer in corn fields is an effective way to decrease P loss.
4R	Conservation practices decrease P loss. The effect of one or a combination of practices was equal. Conservation practices were more effective in corn fields.

MORE PROJECT RESULTS ▼

Figure 4. Effects of P Applied (slopes) are reduced when using one or more conservation practices and the effects vary by crop type. Both the x- and y-axes are in natural logarithm scale (log kg/ha/yr). The values on the x-axis are centered log loading (log kg of P/ha/yr—mean of log P applied, for example, 0 represents the geometric mean of P applied).



song.qian@utoledo.edu

MEET SONG

Song's interest lies in the application of Bayesian statistics in ecological and environmental studies. "The goal of 4R research is to best managing nutrient in agriculture practices, which fits well with my interest in lake eutrophication management. The project also provides a perfect case study of statistical causal inference."

PUBLISHED REPORTS

Applying Statistical causal analyses to agricultural conservation: A case study examining P loss impacts. Song S. Qian, R. Daren Harmel. 2016. JAWRA 52:1 198-208.

Assessing the effects of conservation practices and fertilizer application methods on nitrogen and phosphorus losses from farm fields – A meta-analysis. Stephanie A. Nummer, Master's thesis. The University of Toledo, 2016.

WHAT DO WE DO NEXT?

- Improve research reporting to include field conditions, specific conservation practices, and presence of conservation practices.
- Determine which conservation practices to compare.
- Field characteristics that influence nutrient loss like slope and soil test P need to be reported