Agricultural & Biological ENGINEERING

Li-Chi Chiang earned her BS and MS in Bioenvironmental Systems Engineering from National Taiwan University in 2005. She joined the ABE Ph.D. program in January 2007. Her research focuses on understanding the impacts of factors affecting BMP performance on water quality.

Thesis Defense

Speaker: LI-CHI CHIANG

Title: Evaluation of the Effectiveness of BMPs for Improving Water Quality in a Pasture Dominated Watershed

Major Professor: Dr. Indrajeet Chaubey

Date: July 8, 2010

Time: 1:30 pm

Place: ABE 301

Abstract:

Due to intensive farm practices, non-point source (NPS) pollution has become one of the most challenging environmental problems in agricultural and mixed land use watersheds. The NPS pollution problem can be controlled by implementing various best management practices (BMPs) in the watershed. The objectives of this research were to: 1) evaluate comprehensive BMP scenarios in a pasture dominated watershed in controlling sediment and nutrient losses at various temporal and spatial scales; 2) evaluate the impacts of weather variation, land use changes and pasture management on improving water quality; 3) hindcast the watershed responses under best and worst suite of BMPs implemented in the watershed; 4) optimize the selection and placement of BMPs to both minimize the BMP-implemented area and pollutant loadings from the pasture lands. A total of 171 different BMP combinations were evaluated for their effectiveness using the Soil and Water Assessment Tool (SWAT) model. The model results indicated that buffer strips and grazing management were two most important BMPs affecting the losses of total N and total P from the pasture areas. Variability in weather conditions significantly affected BMP performance; under certain weather conditions, increase in pollutant losses can be greater than reductions due to BMPs implemented in the watershed. By differentiating the impacts of land use changes and pasture management, the pollutant losses at subwatersheds were found to be contributed by different impacts. The results of selection and placement of BMPs showed that the optimization is less effective when certain suite of BMPs are not considered (e.g. VFS), and it requires much longer computation time than the targeting method to search for optimum BMPs. Although targeting method is effective in selecting and placing an optimum BMP, larger areas are needed to have BMPs implemented to achieve same pollutant reductions using the optimization tool.