SEMINAR ANNOUNCEMENT

MARMARA UNIVERSITY

ENVIRONMENTAL ENGINEERING DEPARTMENT

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An Integrated Social and Ecological Model: Impacts of Agricultural Conservation Practices on Water Quality

Most phosphorus loading to Lake Erie (USA) is now attributable to agricultural non-point sources; hence a better understanding of the factors that affect the ecosystem health is crucial. Decisions farmers make regarding the adoption of conservation practices are inherently dynamic, affected by changes in social, economic and environmental conditions, whereas the water quality models used to assess policy interventions lack this dynamic social component. To bridge this gap, this talk presents three necessary steps to evaluate the impacts of farmers' adoption of conservation practices on water quality using a coupled natural and human systems modeling approach. The necessary steps are: 1) water quality modeling of the Sandusky watershed, Ohio, USA using Soil and Water Assessment Tool (SWAT), 2) development of a farmer typology of conservation practice adoption among Corn Belt farmers and building an agent-based model (ABM) for adoption of conservation practices using the farmer typology, and 3) coupling the ABM with the water quality model to understand impacts of conservation practice adoption on water quality.

In this work, SWAT is used for the Sandusky basin for 1970-2010 to simulate nutrient loading, particularly focusing on dissolved reactive phosphorus (DRP). The results indicate that recent increased storm events, interacting with changes in fertilizer application timing and rate, as well as management practices that increase soil stratification at the soil surface, appear to increase DRP runoff. Regarding farmer typology, the broad literature review on conservation practices adoption by Corn Belt farmers consistently identify four policy-relevant farmer characteristics, namely farm size, land tenure arrangements, source of income and information networks. In an examination of these characteristics, four broad farmer types emerged: traditional, supplementary, business-oriented, and non-operator farmers. To study the dynamic social component of farmers on water quality, an ABM of conservation practice adoption by farmers using the farmer typology is built. The results of ABM are used as input for water quality models to explore the linkages between social and biophysical processes within this coupled system. This linked modeling framework highlights the importance of non-operator owners and the influence of crop revenue insurance in lieu of commodity payments on farmers' adoption decisions.

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