CABBI
CENTER FOR ADVANCED BIOENERGY AND BIOPRODUCTS INNOVATION

Unintended Consequences of Biomass Markets and Implications for Nitrate Reduction Policy

Background/Objective

Nitrate loss from annual cropping systems in the U.S. Corn Belt, in the form of runoff and leaching, is the primary source for water quality degradation in the Mississippi River Basin and its estuaries. Energy crops are considered a promising approach to reduce nitrate loss to groundwater and surface water from cropland, but they are costly to adopt and will require biomass market-based payments and/or policy incentives to induce production.

Approach

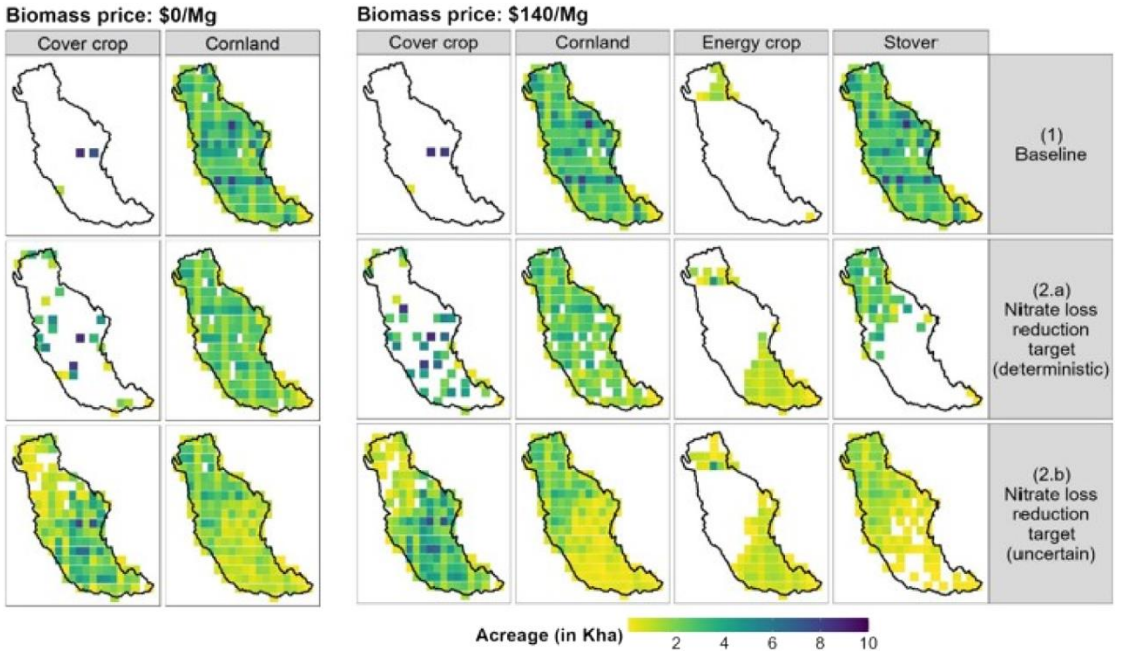
Researchers developed a spatially explicit integrated economic and biophysical model to assess the implications of biomass markets at various biomass prices for nitrate loss in the Raccoon River Basin, Iowa. The nitrate loss abatement strategies considered include energy crops (i.e., energy sorghum, miscanthus, and switchgrass), winter rye cover crops, and a switch from continuous corn to corn-soybean rotation.

Results

The study found that high biomass prices are needed to increase energy crop adoption and that low biomass prices induce corn stover harvesting. This creates incentives to expand nitrogen (N)-intensive continuous corn systems, which have deleterious effects on water quality. To achieve targeted nitrate loss reduction cost-effectively, the introduction of biomass markets needs to be accompanied by the imposition of a nitrate price.

Significance/Impacts

These findings demonstrate the need for designing appropriate policy incentives that help avoid the unintended consequences of biomass markets as the sole mechanism for incentivizing energy crops to achieve water-quality goals in a watershed.



Cost-effective crop mix at the 10 km scale under selected scenarios, with cornland and stover acreages shown referring to land without cover cropping.

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