

Supplementing Biofuel Mandates with a Carbon Mitigation Policy Can Lead to Water Quality Co-benefits

Background/Objective

Biofuel mandates can indirectly influence biofuel life cycle trace greenhouse gas (GHG) emissions, impacting soil carbon (C) stocks due to land use change, or impacting nutrient runoff due to changes in fertilizer application and crop selection. This work explores economic and environmental trade-offs of combining biofuel mandates with different policy options to reduce GHG emissions and nitrate loss-related water pollution stemming from bioenergy production.

Approach

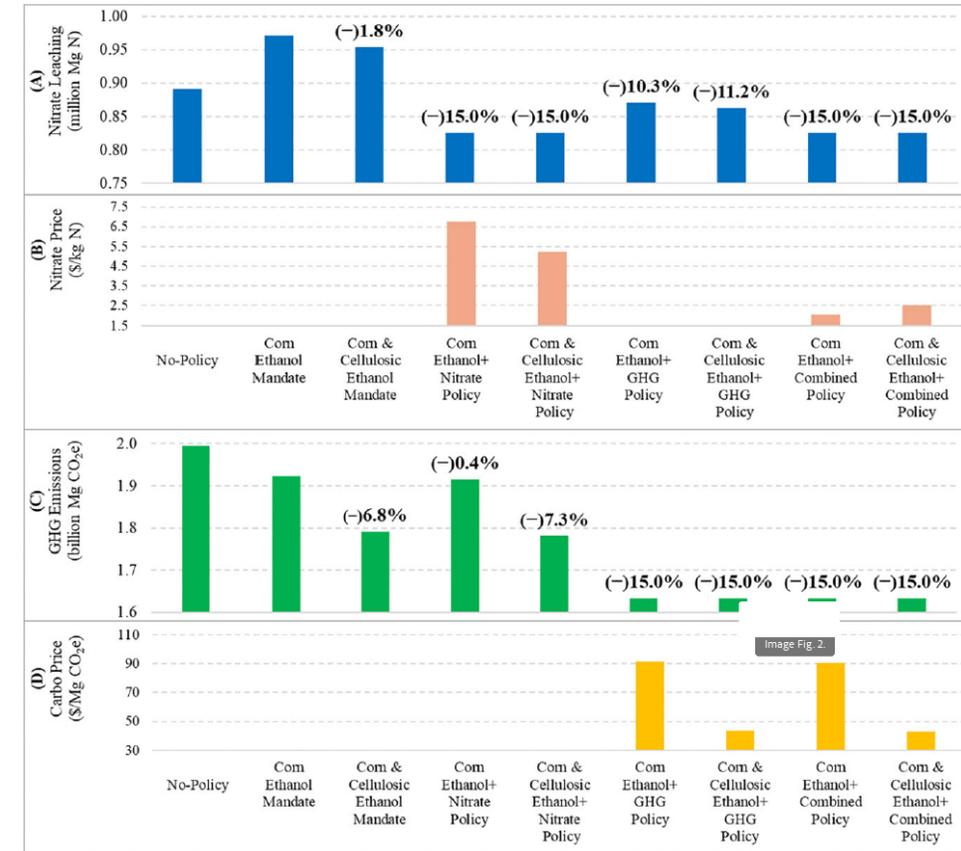
Researchers developed an integrated, spatially explicit ecosystem-economic modeling framework to analyze the cost-effectiveness of alternative policies in addition to a biofuel mandate to achieve desired reduction targets of GHG emissions from U.S. agricultural and fuel sectors and nitrate leaching in the Gulf of Mexico below the levels that would be achieved by a corn and/or cellulosic ethanol mandate in the U.S.

Results

Corn and cellulosic ethanol mandates provide mixed environmental benefits. Relative to no biofuel policy, the addition of a cellulosic biofuel mandate to the corn ethanol mandates results in greater GHG emissions reductions and smaller increase in nitrate leaching. The addition of a GHG and/or nitrate reduction target with one or both types of biofuel mandates leads to co-benefits of reducing both GHG and nitrate runoff. If specific reduction targets for both GHG and nitrate are desired, then both C and nitrate prices are required.

Significance/Impacts

This work examines the costs of achieving various nitrate leaching and GHG reduction targets and their distributional effects on the U.S. food and fuel consumers and producers, showing that disregarding policy co-benefits can overestimate the GHG and nitrate prices needed to achieve policy targets and lead to higher policy costs.



Nitrate leaching, nitrate price, GHG, and C price under alternative policy scenarios, 2035.