BRC Science Highlight
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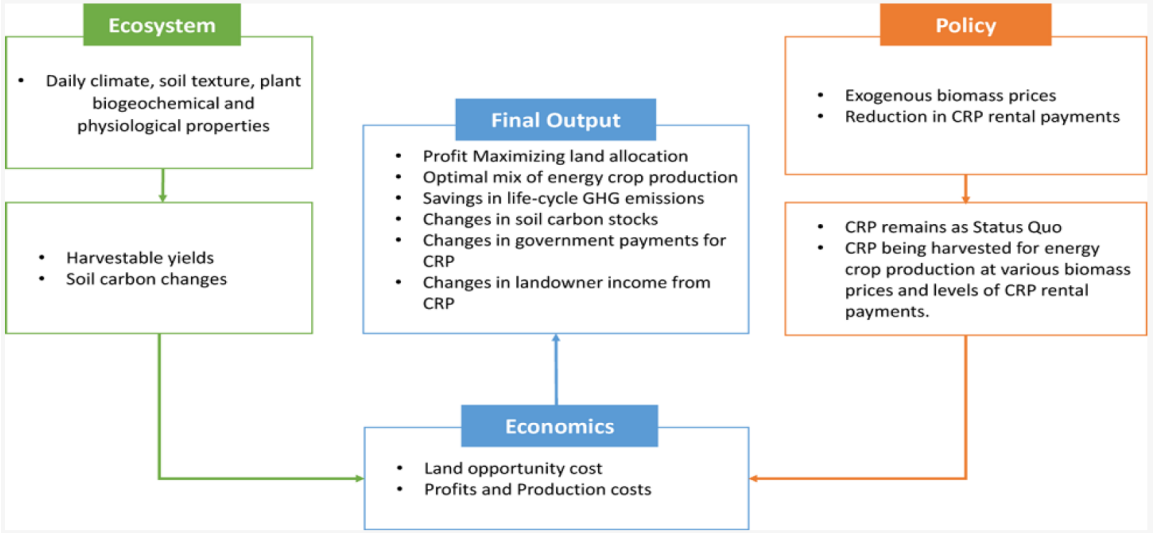
Assessing the Returns to Land and Greenhouse Gas Savings from Producing Energy Crops on Conservation Reserve Program Land

Objective

To avoid competition with food crops, there has been growing interest in using land enrolled in the Conservation Reserve Program (CRP) for bioenergy crop production. However, it is unclear how policy would influence the economic viability of the conversion of CRP land to bioenergy crop production and what the greenhouse gas (GHG) implications of this land-use change would be. This work generated an integrated economic-ecosystem modeling framework to answer these questions.

Approach

- Integrated DayCent yield estimates into BEPAM model to simulate economically optimal CRP land allocation between a) remaining in the CRP with no biomass harvest or b) growing miscanthus or switchgrass at varying biomass prices and land rental payment rates.
- Quantified economic and GHG implications of harvesting energy crops on CRP land.



Policy choices and ecosystem modeling informed economic modeling to generate predicted economic gains and GHG savings under different land-use scenarios.

Results

- A maximum land conversion of 3.4 million ha in CRP can be achieved at a minimum biomass price of \$75 Mg^{-1} with full land rental payment or \$100 Mg^{-1} at 75% rental payment.
- Soil carbon debt due to transition from CRP to energy crops is short-lived and can be entirely offset after the conversion year for miscanthus and within four years for switchgrass, after including the savings in life-cycle GHG emission through displacement of gasoline or coal-based electricity.
- If biomass prices are \$75-\$125 Mg^{-1} and land rental payments are reduced by 25%, harvesting energy crops on CRP land can lead to net discounted benefits as high as \$28-125 billion over the 2016-2030 period, including: (1) \$2-3 billion of savings in government payments to maintain existing CRP enrollment; (2) \$10-54 billion increase in landowner income; (3) \$16-\$30 billion (or \$35-68 billion) of monetized benefits from GHG mitigation through displacement of fossil fuels (or coal-based electricity).

Significance

This study shows the potential for economic and GHG benefits from using CRP land for harvestable bioenergy crop production in the rainfed United States.

Chen, et al. 2021. "Assessing the Returns to Land and Greenhouse Gas Savings from Producing Energy Crops on Conservation Reserve Program Land." Environmental Science and Technology. DOI: 10.1021/acs.est.0c06133.

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