CABBI
CENTER FOR ADVANCED BIOENERGY AND BIOPRODUCTS INNOVATION

Designing Cost-Effective Carbon Payments to Induce Cellulosic Feedstock Production for Sustainable Aviation Fuel

Background/Objective

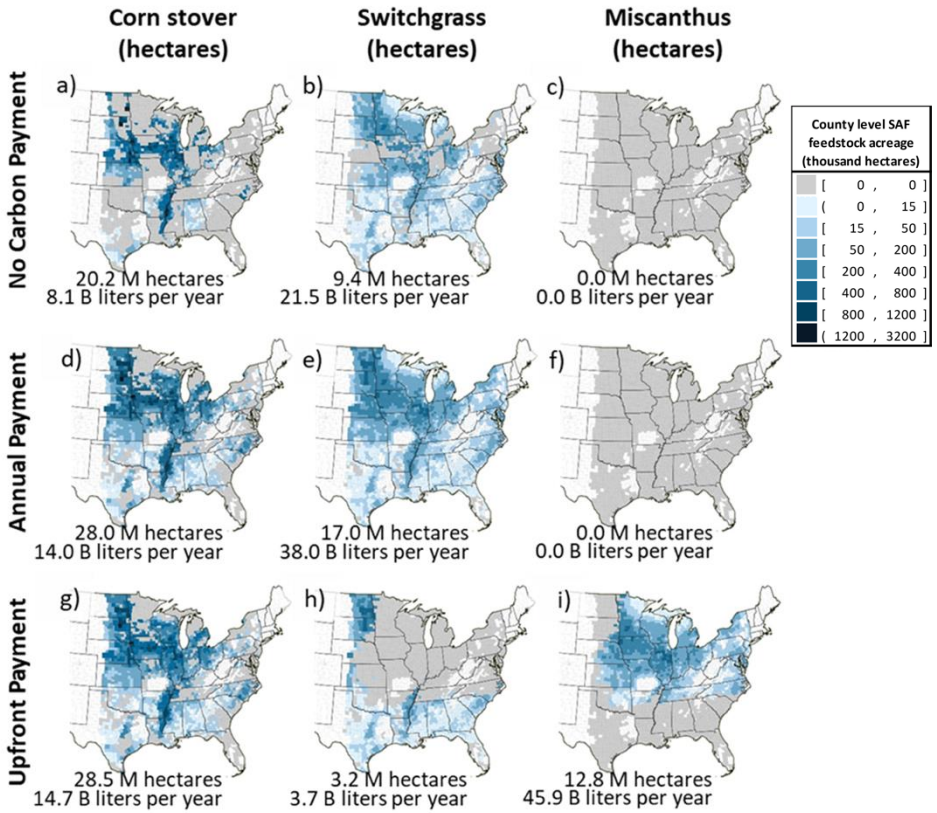
Sustainable aviation fuels (SAF) based on crop residues such as corn stover or perennial bioenergy crops such as miscanthus or switchgrass have the potential to mitigate carbon (C) emissions. However, SAF production scale-up is hindered by high establishment costs, establishment lags, and yield and price riskiness, making their return profiles for SAF feedstocks less appealing to risk-averse, present-biased, and credit-constrained farmers.

Approach

Researchers developed an economic model incorporating spatially varying joint yield and price distributions for multiple farmer crop choices and applied it to examine the incentives for risk-averse, present-biased, and credit-constrained farmers to produce cellulosic feedstocks under various biomass prices. They quantified the spatially varying C mitigation benefits from these feedstocks in the U.S. rainfed region to compute SAF production and spatial patterns of feedstock adoption under annual and upfront C payment policies.

Results

All three farmer groups preferred lower-yielding but less risky switchgrass and corn stover instead of producing lower C intensity, higher yielding but riskier miscanthus, resulting in reduced SAF production. Annual C payments incentivize higher SAF production largely from corn stover and switchgrass while upfront C payments are more effective in incentivizing lower C intensity SAF production from miscanthus.



Spatial biomass production and SAF estimates by feedstock across different carbon payment scenarios.

Significance/Impacts

Our finding that SAF feedstock choice, adoption levels, and spatial patterns depend on the type of C mitigation payments and farmer risk profiles sheds light on potential policy decisions that might incentivize increased bioenergy crop cultivation.

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