Bioenergy crops could lower surface temperatures: research

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Widespread cultivation of perennial grasses for ethanol production could lower regional surface temperatures by nearly 2 degrees F, according to Stanford researchers. Credit: Chung-Ho Lin, Agricultural Research Service, USDA

(PhysOrg.com) -- Converting large swaths of farmland to perennial grasses for biofuels could lower regional surface temperatures, according to a recent Stanford study.

The study, published online in the Feb. 28 edition of the Proceedings of the National Academy of Sciences (*PNAS*), comes on the heels of federal initiatives to wean the United States off fossil fuels by mandating significant increases in ethanol production. The Department of Agriculture forecasts that by 2018, more than one-third of the country's corn harvest will be used to produce ethanol.

But concerns about the impact of corn ethanol on food prices, deforestation and global warming have raised interest in the cultivation of perennial grasses – such as switchgrass – as alternative sources of biofuel. Previous studies suggest that ethanol made from switchgrass emits less carbon dioxide than corn-derived ethanol and would therefore have less of an impact on global warming.

In the *PNAS* study, researchers found that widespread cultivation of perennial grasses could actually reduce the surface temperature of Earth at a regional scale.

"We've shown that planting perennial bioenergy crops can lower surface temperatures by about 2 degrees Fahrenheit [1 C] locally, averaged over the entire growing season," said study co-author David Lobell, assistant professor of environmental Earth system science and a center fellow at Stanford's Program on Food Security and the Environment. "That's a pretty big effect, enough to dominate any effects of carbon savings on the regional climate."

In the study, Lobell and his colleagues used a computer simulation to forecast the climatic effects of converting farmland in the Midwest from annual crops – like corn and soybeans – to perennial grasses. The results showed that large-scale perennial cultivation in the 12-state area would pump significantly more water from the soil to the atmosphere, producing enough water vapor to cool the local surface temperature by 1.8 F.

"Locally, the simulated cooling is sufficiently large to partially offset projected warming due to increasing greenhouse gases over the next few decades," the authors wrote.

"A key issue remaining is whether the additional water being pumped from the soil gets fully replenished by rainfall, or whether in the long

term the soil dries and can't support the same amount of crop production," Lobell said.

"More study is needed to understand the long-term implication for regional water balance," added lead author Matei Georgescu of the Center for Environmental Fluid Dynamics at Arizona State University. "This study focused on temperature, but the more general point is that simply assessing the impacts on carbon and greenhouse gases overlooks important features that we cannot ignore if we want a bioenergy path that is sustainable over the long haul."

More information: foodsecurity.stanford.edu/publ … n_the_united_states/

Provided by Stanford University