Some biofuels might do more harm than good to the environment, study finds

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Biofuels based on ethanol, vegetable oil and other renewable sources are increasingly popular with government and environmentalists as a way to reduce fossil fuel dependence and limit greenhouse gas emissions.

But new research led by a biologist at the University of Washington, Bothell, shows that some of the most popular current biofuel stocks might have exactly the opposite impacts than intended. The authors of a paper published in the June issue of the journal *Conservation Biology* offer a dozen policy recommendations to promote sustainability and biodiversity in biofuel production.

The study looked at factors such as the energy needed to produce a renewable fuel source compared with how much energy is produced, the impact on soil fertility and effects on food supply when fuels based on crops such as corn and soybeans are mixed with fossil fuels. Based on those factors, the authors determined that corn-based ethanol is the worst alternative overall.

"It's foolish to say we should be developing a particular biofuel when that could mean that we're just replacing one problem with another," said lead author Martha Groom of the UW Bothell. Co-authors are Elizabeth Gray of The Nature Conservancy and Patricia Townsend of the UW Seattle.

The authors argue that precise calculations are needed to determine the ecological footprints of large-scale cultivation of various crops used for

biofuels. They note, for example, that because such large amounts of energy are required to grow corn and convert it to ethanol, the net energy gain of the resulting fuel is modest. Using a crop such as switchgrass, common forage for cattle, would require much less energy to produce the fuel, and using algae would require even less. Changing direction to biofuels based on switchgrass or algae would require significant policy changes, since the technologies to produce such fuels are not fully developed.

The paper's policy suggestions are "not definitive at all," Groom said, "but rather each category calls out a question and is a starting point in trying to find the proper answers."

These concerns are becoming more acute with the rapid rise of both food and fuel prices, she said. The issue is especially touchy for farmers who might for the first time be realizing significant profits on their crops, but it also is a serious concern for motorists.

"I've heard about people getting their gas tanks siphoned, and I hadn't heard of that since the '70s," she said.

A difficulty, Groom said, is that while escalating prices add pressure to find less costly fuel sources, acting too hastily could create a host of other problems. For example, farmers who plant only corn because it is suddenly profitable, and don't rotate with crops such as soybeans, are likely to greatly deplete their soil, which could limit crop growth and promote soil erosion.

Also, some plants are better than others for absorbing carbon dioxide from the atmosphere, while others perhaps need more cultivation, which requires more fossil fuel for farm equipment. In addition, fertilization, watering and harvesting all require energy.

The study took about a year to conduct and is a synthesis of peer-reviewed research published in a various journals. The scientists examined the literature looking for indicators of biofuels that are more sustainable and carry a smaller ecological footprint, then used that information to derive the policy recommendations.

The primary audiences for the work are policy makers, students and other biologists, Groom said. The primary goals are to establish a logical basis to evaluate options for biofuel development and to spur new research to find the most ecologically promising alternatives.

"We don't want to make new mistakes. If we don't ask the right questions to start with, we're going to replace old problems with new ones," she said.

Policy Recommendations

-- Calculate a biofuel's ecological footprint
-- Promote only biofuels that can be produced sustainably
-- Select highly efficient species for biofuels
-- Work to minimize land needed for biofuels
-- Encourage reclamation of degraded areas
-- Prohibit clearing areas for more cultivation
-- Promote use of energy crops that require less fertilizer, pesticide and energy
-- Promote native and perennial species
-- Prohibit use of invasive species
-- Promote crop rotation on cultivated lands
-- Encourage soil conservation
-- Promote only biofuels that are at least net carbon neutral

Source: University of Washington