Biofuel's Water Problem

Irrigating biofuel crops on a grand scale would be disastrous

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Photo: Jeremy Nixon/Alamy

The great advantage of biofuel over petroleum is that the sources of biofuel are so widely available. The geologic fates may not have endowed your corner of the world with oil or gas deposits, but just about everyone can grow plants to make fuel. Unfortunately, some of the places these crops are grown require irrigation, and when water enters the equation, biofuels are a lot less attractive than the stuff they're replacing.

Take soybeans. According to Carey W. King and Michael E. Webber of the University of Texas at Austin, the processing required to turn soybeans into biodiesel requires negligible water. But if you can't depend on rain, raising the crop in the first place takes buckets. On average in the United States, 28 liters of irrigation water are needed to produce enough soybeans to propel an average vehicle 1 kilometer (12 gallons of water consumed per mile driven). Ethanol produced from corn grown on irrigated fields is almost as bad. Driving a typical flexible-fuel vehicle on E85 (85 percent ethanol fuel) produced from irrigated cornfields consumes about 26 L/km on average, assuming both the corn's seed and stalks are transformed into ethanol.

WATER VS ENERGY SPECIAL REPORT

At present, less than 20 percent of the corn grown in the Midwestern corn belt of the United States is irrigated. But the increases in corn production appear to be in areas where irrigation is common. That's a problem, because irrigation already accounts for 37 percent of the water withdrawn from aquifers, lakes, and rivers in the United States (about the amount used in energy production).

Now let's look at the water involved in the production of conventional petroleum fuels. According to King and Webber, whether you use gasoline or diesel in your car, driving it a kilometer takes less than 0.33 L of water. Even that very modest estimate "could be overly pessimistic about freshwater consumption," says King, because it doesn't take into account that some of the water used to boost oil recovery is extracted from oil wells themselves.

Even the more problematic sources of petroleum—tar sands and oil shale—don't consume all that much water. True, you need high-temperature steam to separate the petroleum from the rock it's found in. But according to King and Webber, the processing of tar sands into fuel consumes on average just 0.78 L/km of water, and the processing of oil shale takes even less: 0.59 L/km.

Judged on a water-use Richter scale, then, petroleum extraction and processing make for mere tremors, whereas corn- or soybean-based biofuels can amount to building-leveling quakes. In their latest study (with Ian Duncan, published this past February), King and Webber suggest that by 2030 about 8 percent of U.S. freshwater consumption might go toward making biofuels. Plugging in an EV needs more water than gasoline, but not nearly as much as biofuels.

A better idea is to use crops that don't require any more water than what local rains provide. Oil palms in Indonesia and sugarcane in Brazil are already being used to produce biofuels in large quantities without irrigation. It's not that these plants don't need lots of water; it's just that the tropical lands they are grown on receive abundant rains. Indeed, it might make more sense to import biofuels from such water-rich regions of the globe than to try to grow them where there's not enough water. One thing's for sure: The future of any crop now being touted as a good source of biofuel will hinge on how it slakes its thirst.

To Probe Further

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