Responses Under Pressure

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Responses Under Pressure

As some of the broader impacts of the cultivation of biofuel feedstocks have become more apparent—not just the direct effects on greenhouse gas emissions but also indirect effects triggered by changes in the supply of agricultural commodities—so has the need to accurately estimate them. The assessment of the greenhouse gas emissions expected to flow from such induced land-use change (e.g., when farmers in Central America cut down forests to grow crops to replace the reduction in maize availability) has become a policy battleground.

The stakes are high: The 2007 Energy Independence and Security Act mandates a steep increase in the production of biofuels over the next dozen years, and requires estimates of life-cycle emissions of greenhouse gases from biofuels to be considered when establishing crucial definitions used for enforcement. The Environmental Protection Agency is currently wrestling with these definitions for a final rulemaking on new renewable fuel standards. Moreover, the California Air Resources Board has set rules that explicitly require the effects of indirect land-use change to be considered in establishing changes to its renewable fuel standards.

Because ethanol from maize accounts for almost all US biofuel production, assessments of its life-cycle greenhouse gas emissions drive the maelstrom. Tensions were only exacerbated by Timothy Searchinger and colleagues' publication in 2008 of a calculation suggesting that, once global indirect land-use changes are counted, production of corn ethanol led to greenhouse gas emissions twice as large as those from burning gasoline; using switchgrass as a feedstock instead still increased total emissions. So much for green biofuels.

The Forum article by Thomas W. Hertel and coauthors that starts on p. 223 attempts to refine estimates of net greenhouse gas emissions resulting from the mandated increase in biofuel production. Its methodology, based on an equilibrium economic model that estimates market responses to changes in crop availability in different regions of the world, yields results only somewhat less alarming than those of Searchinger. The new estimate should be little comfort to ethanol manufacturers, or to anyone who would use prime agricultural land for fuel production. Hertel and colleagues write that their estimate is "enough to cancel out the benefits that corn ethanol has on global warming."

The article is a valiant attempt at cross-fertilizing biology and economics to get the measure of a globally important effect of US policy, and as such deserves widespread attention. Hertel and his coauthors do their best to test the stability of their assessment, and it seems likely that others will build on their approach. It suggests a possible route for ecologists to get a grip on human responses to other sorts of environmental pressure.

Yet the article also reminds the reader of the numerous uncertainties surrounding attempts to model human behavior, and the difficulty of framing the real-world boundaries of such an analysis—obstacles Hertel and his coauthors acknowledge. The unexpected can be expected, and when it arrives, econometric studies will have to be redone. Still, a combination of biology and economics seems a more reliable guide to the future than would be either discipline alone.

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