

MICHIGAN STATE
UNIVERSITY

Letter to the Editor of *Science*
February 16, 2008

Dear Editor:

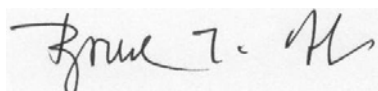
Recent papers in *Science* by Fargione, et al (1) and by Searchinger, et al, (2) connect increased demand for corn for biofuel production with large, indirect land use changes and resulting greenhouse gas emissions. Both studies have important omissions and deficiencies. I will discuss only those deficiencies that relate to life cycle analysis (LCA). LCA is a standards-driven procedure for determining the environmental impacts of products and processes (3, 4, 5). Credible LCA is completely data dependent. However, there are no data in either paper on the land use changes that actually occur as more corn is processed to ethanol. They are in fact highly speculative and uncertain scenarios for what might happen as a result of increased corn demand.

Even if there were data connecting increased corn demand for ethanol with land use changes, ethanol produced in the U.S. would not be “responsible”, in a strict LCA sense, for anything but its own environmental profile. “New” corn produced in Brazil by clearing savannah to satisfy animal feed demand is responsible for its environmental profile as an animal feed, not as an ethanol feedstock. It is arbitrary and unreasonable to make individuals who are producing biofuels responsible for the tenuous, uncertain land use decisions of other individuals many miles away who are producing animal feed.

This is clearly different from the situation in which tropical wet lands are actually converted to oil palm production to provide oil for biodiesel production. Direct land use change as a result of biofuel production is a legitimate subject for LCA and carries a reasonable level of certainty. In contrast, indirect land use change supposedly caused by biofuel production is tenuous, uncertain and highly speculative.

Why this emphasis on LCA? Because recent U.S. legislation requires that certain “lifecycle greenhouse gas emission” standards are achieved for renewable fuels, including emissions caused by land use changes. Direct land use changes caused by biofuels can be studied by LCA. Indirect land use changes currently cannot. We should not make biofuel policy decisions on such an uncertain scientific foundation.

Sincerely,



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1. Fargione, J., J. Hill, D. Tilman, S. Polasky, and P. Hawthorne, 2008, "Land Cleaning and Biofuel Carbon Debt," *Scienceexpress*, available at www.sciencexpress.org, Feb. 7.
2. Searchinger, T., R. Heimlich, R.A. Houghton, F. Dong, A. Elobeid, J. Fabiosa, S. Tokgoz, D. Hayes, and T.H. Yu, 2008, "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases through Emissions from Land Use Change," *Scienceexpress*, available at www.sciencexpress.org, Feb. 7.
3. Kim, S. and Dale, B E. "Allocation Procedure in Ethanol Production System From Corn Grain I. System Expansion" *International Journal of Life Cycle Assessment* **7** (4), 237-243 (2002)
4. Kim, S.; Dale, B. E.; "Life cycle assessment of various cropping systems utilized for producing biofuels: Bioethanol and biodiesel" *Biomass & Bioenergy* **29**, 426-439, (2005).
5. Kim, S.; Dale, B. E.; "Life cycle assessment study of biopolymers (polyhydroxyalkanoates) derived from no-tilled corn" *International Journal of Life Cycle Assessment* **10**, 200-210, (2005).