Comments for European Commission Consultation on Indirect Land Use Change and Biofuels

October 2010

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In response to the specific questions in the consultation document:

1. All projected estimates of ILUC emissions from food-competitive biofuel feedstocks show non-zero values, and in many cases, values that are a substantial fraction of total biofuel life cycle GHGs. Consideration of uncertainty (Plevin, O'Hare et al. 2010; attached)[1] and of the time profile of emissions (O'Hare, Plevin et al. 2009) from ILUC only increase these values. Our work suggests that most point estimates of ILUC emissions for US corn ethanol (for example) are at the low end of the plausible range.

2. Yes, EU action is needed. While there is no agreement yet on specific (per-pathway) values for ILUC emissions, it is clear that ILUC emissions are potentially large enough to cancel any perceived GHG benefits of some biofuels. Excluding this phenomenon from regulation invites perverse policy outcomes. Among these are increased global warming, and obstruction of cellulosic biofuel market penetration as the latter's principal expected advantage (avoidance of much ILUC through higher yield) is suppressed.

3. Yes, effects vary according to feedstock type. Feedstocks that compete for land with commodities (such as food) that have highly inelastic demand encourage ILUC. Where demand is elastic, the benefits of biofuels are obtained by sacrificing consumption of food, feed and/or fiber (FFF). Feedstocks that avoid this competition generally avoid ILUC. Within food-competitive feedstocks, ILUC effects will vary with yields of feedstock, co-products, type of biofuel, and the "replacement" commodity with which FFF markets respond to fuels' use of their source commodity (see below re palm oil and biodiesel).

It is repeatedly suggested that biofuel cultivation on marginal or abandoned land avoids ILUC. Unless biofeedstock is the only crop this land can support, this cannot be the case: when such land is improved to the point that an economically viable biofeedstock crop can be grown on it, it could then be used for FFF, and if it is not, an ILUC effect can be attributed to the biofuel. It is possible that biofeedstock cultivation can be forced onto such lands by subsidies or even regulation, but the price per tonne of GHG reduction will then be extremely high.

[1] We note that the journal ES&T prohibits publication of the attached Plevin et al 2010 on a website, however you can post this link to the article http://pubs.acs.org/doi/pdfplus/10.1021/es101946t

4. We recommend discouraging the use of food-competitive biofuels. Feedstocks that are generally food-competitive might, in specific instances, be shown to avoid this competition, and thus need not be discouraged.

Setting a minimum GHG savings threshold for biofuels (and presumably not explicitly including ILUC emissions) either penalizes feedstocks with low ILUC risk, or it cannot provide a sufficient safety margin for fuels with a high ILUC risk, and is in any case a coarse and imprecise screen. The way to recognize ILUC is to estimate it as well as possible, to recognize the uncertainty inherent in these estimates, to explicitly incorporate an appropriate "safety factor," and to make the hard regulatory decisions.

Additional sustainability requirements for biofuel production are unlikely to matter for ILUC; only higher yields, that allow biofeedstocks to use less land per MJ produced, makes much difference as the ILUC effect is transmitted far and wide through commodity prices. It is sometimes suggested that the best way to avoid ILUC is for jurisdictions where it occurs to better protect their forests and high-carbon-stock lands. This is true, but biofuel producing countries do not have authority over the distant and separate nations where ILUC mainly happens, so it is not a realistic policy recommendation.

If higher yields are obtained, for example, by fertilization that releases a lot of N_2O, the ILUC reduction from increased yield might easily be outweighed by the climate effect of the fertilization.

ILUC is just one market-mediated climate effect of increasing biofuels production. In principle, if we include one such consequence, it would be logical to include all others that we anticipate may have non-trivial climate effects. For example, expanding global fuel supply by producing biofuels reduces the global price of petroleum, which causes more fossil fuel to be used and increases emissions relative to the baseline. As with ILUC, the magnitude of this effect is uncertain, but may be large enough to warrant attention. For example, biofuels with a life cycle GHG rating, say, 30% lower than that of the corresponding petrofuel, appear to reduce GHG emissions, but if the petroleum rebound effect is greater than 30% (and several estimates indicate this may be the case, e.g., Barker and Foxon 2006; de Gorter 2010; Ros, Overmars et al. 2010; Stoft 2010) then incentivizing these biofuels will result in a net increase in emissions. Undercounting biofuel life cycle GHGs by excluding ILUC only makes matters worse, as does ignoring the time profile of ILUC emissions.

Our collective inability to estimate the actual environmental and social consequences of increasing biofuels production is a fundamental property of complex human-environmental systems. More research may improve estimates and narrow uncertainties, but uncertainty about ILUC and rebound effects implies uncertainty about whether promoting certain biofuels actually mitigates climate change.

While we can produce models that estimate these effects, we will still be left with the problem of selecting a value to use from a wide distribution of plausible values. The appropriate value to use depends on a social level of risk aversion and on the perceived cost of error (this last is a matter of ongoing research (O'Hare, Plevin et al 2010)).

Existing biofuel GHG regulations presuppose that (i) life cycle assessment can provide a robust estimate of the GHG effects of a fuel pathway, and (ii) if a biofuel GHG rating is lower than the corresponding petrofuel rating, then using that biofuel necessarily reduces GHG emissions. Unfortunately, both of these assumptions are demonstrably false.

The intractable uncertainty in estimates of indirect effects can be partially side-stepped by avoiding fuels that have a high risk of ILUC because they compete with food, feed and fiber. Any approach to ILUC that requires choosing a specific value—whether ignoring the effect entirely or choosing a value from a wide frequency distribution—may backfire.

Certain crop biofuels seem to be *likely* to cause very high or very low ILUC effects and deserve increased research attention. In the prior category is all diesel from edible oil, because when oil is withdrawn from this market, it is largely replaced by palm oil expansion in southeast Asia, where lax forest protection leads to high-carbon forest being cleared and worse, forest on peat land whose GHG emissions when drained are enormous. In the latter category may be Brazilian (and possibly other tropical) sugar cane ethanol, owing to its extremely high yield, near-complete use of the whole plant for energy in modern refineries, and existing Brazilian land use patterns, especially recently, of increasing cattle stocking rates rather than clearing forest and savanna. As a rule, biofuel from seeds induces ILUC that wipes out its climate advantage over fossil fuel; biofuels from whole fast-growing plants, including cellulosic biofuel when it is available, and from waste wood (thinning, slash, etc.) and from non-land-based biofeedstock (algae, again when available) pose much less risk of ILUC. .

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