Indirect Land Use Change – Science or Mission?

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The current discussions of indirect land use change (iLUC) and the greenhouse gas (GHG) reduction potential of bioresources have turned into a rather controversial debate. The scientific robustness and consistency of current iLUC models and data are at least unclear. However, representatives of the scientific community still dare to provide straightforward political advice in their papers – way beyond the fact-based 'proof' of their data and on a level that is usually not accepted by scientific journals. But the actual task and challenge for the scientific community is to determine the environmental performance of bioresources as objectively and fact-based as possible – with a clear and sober focus on integrity and soundness, not sense of mission.

Keywords: Land use change; Indirect land use change; Life cycle assessment; LCA; Carbon footprint; CF; Greenhouse gases; GHG; Biofuels

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The iLUC Debate

The 'food versus fuel' debate and the discussion about the environmental performance of biofuels in general have led to the development of the concept of indirect land use change (iLUC) and the proposal to include iLUC factors into environmental assessments of biofuels. There is disagreement about how significant the issue is, what is causing it, and what can or should be done about it.

This controversy is also reflected by the different approaches in sector-specific regulations on biofuels. There are so far two biofuel regulations from the United States of America that already require the inclusion of iLUC factors, *i.e.* the Low Carbon Fuel Standard (LCFS) in California and the Renewable Fuel Standard 2 (RFS2) of the United States federal government. In Europe, the EU Renewable Energy Directive (RED) includes so far only direct land use change greenhouse gas (GHG) emissions, but the future development of a concrete methodology to include iLUC is noted in the RED.

The early life cycle assessments (LCA) and carbon footprints (CF) of biofuels did not address the 'food *vs.* fuel' issue. Recently, the integration of direct and indirect land use change effects into the LCAs and CFs of biofuels is proposed by several scholars. Since the first paper on the iLUC issue by Searchinger *et al.* was published in *Science*, a number of different models (economic general equilibrium or partial equilibrium models as well as simplified models often referred to as deterministic or causal-descriptive models) has been proposed.

The iLUC 'Science'

Due to the growing awareness of the topic and its policy relevance there is an increasing number of scientific contributions to the iLUC debate. There are different modeling schools as well as 'pro-ILUC' and 'con-ILUC' scholars. There is just one thing which is commonly agreed: the uncertainty of iLUC quantification approaches and their results. There is full agreement in the scientific community that the uncertainty is way beyond a level that is usually aimed for in quantitative science. The only scientific difference occurs in the level of cruelty for characterizing the uncertainties – which goes from “significant” to “enormous”.

A recent paper summarized an analysis of the scientific robustness of the iLUC concept and its consistency with international accounting standards for LCA and CF (Finkbeiner 2014). The conclusion was that globally agreed accounting standards for LCA and CF do exist, while there are currently no accounting standards for iLUC at all. In addition, none of the relevant international accounting standards of LCA or CF requires the inclusion of iLUC factors into the assessment. More fundamentally, LCA and CF are based on physical realities, while iLUC is based on market predictions and theoretical assumptions. This is the main reason for the enormous ranges of published iLUC values from 200% below, up to 1700% above the CF of fossil fuels.

This sobering status of iLUC science may also explain the big differences in the political consequences proposed by different stakeholders. Even some scientists with a sense of mission leave the scientific arena and provide active policy advice. Despite the limited knowledge and huge uncertainties described above, several scholars provide ‘exact’ iLUC factors and dare to propose their implementation into regulations.

Scientific integrity would rather imply refraining from the provision of single, more or less arbitrary numbers for iLUC-factors that are prone to be (mis)used out of context. Due to the lack of robustness of the models and the fact that the associated uncertainties are mainly due to systematic rather than statistical errors, there is currently no way to determine which of the iLUC factors put on the market is more right than any other. The issue is not only about the size of the numbers; it is even unclear whether the iLUC effect of certain biofuels is positive or negative. As a consequence, the provision of any single figure for iLUC factors is rather more sham than substance – just data, but no information. Any single figure published to date is more representative of the approach or model used than the crop or biofuel assessed.

Conclusion

ILUC factors are currently still a hasty reaction in method development and an arbitrary choice for decision-making. The isolated application of iLUC for bioresources is scientifically not consistent. If it is a robust and meaningful concept, then it has to be applied to all products, not only one. A fair comparison of bioresources with non-renewable resources requires a level playing field. If iLUC is considered for bioresources as an indirect effect, then the indirect effects of non-renewable resources have to be considered as well. Any arbitrary selection of indirect effects is a value choice, not justified by science.

To provide fact-based information to public policy making is definitely one of the relevant objectives for scientific research. But for scientists the science has to come first - policy comes second. Talking about iLUC, it sometimes seems the other way round. Mixing too much mission into science produces a cocktail that comes with a bitter aftertaste for academic credibility.

Reference Cited

Finkbeiner, M. (2014) “Indirect land use change - help beyond the hype?” *Biomass and Bioenergy* 62, 218-221.