

INDIRECT LAND USE CHANGE (iLUC) IMPACTS OF BIOFUELS IN CLIMATE CHANGE IMPACT CATEGORY: TO BE, OR NOT TO BE?



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introduction & objective: what is iLUC?

LCA studies of biofuels still hold an advantage in terms of GHG emissions savings on fossil fuels. This statement is questionable if the effects that may have the feedstock crops for biofuels on commercial products from biomass are not counted in the whole life cycle. Induced tensions in the market for other products can cause changes in land use which, in turn, affect GHG emissions. This effect is called **indirect Land Use Change (iLUC)**.

The objective of this study is to present the current situation of this issue in Europe. This work is a initial part of a higher scope project, whose final objective is the quantification of GHG emissions from iLUC in Spanish biofuels production.

Figure 1. Direct and indirect impact of land use change (www.2011.nesteoil.com).

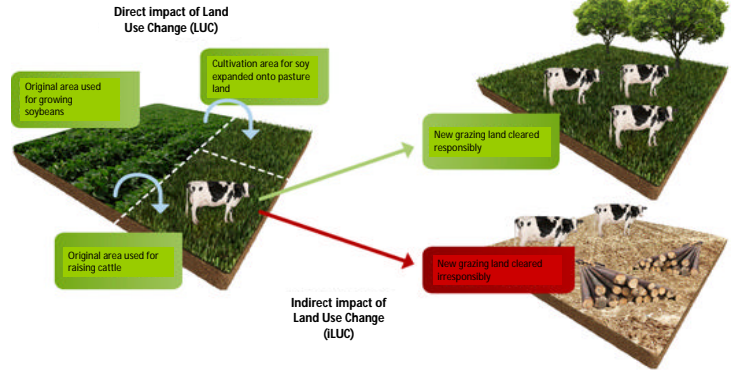


Table. Main model types for accounting iLUC GHG emissions (adapted from Yeh & Witcover 2010).

MODEL TYPES	Economic equilibrium (general or partial)	Causal-descriptive	Deterministic
<i>Description</i>	Regional supply and demand for biofuel feedstocks and related to agricultural commodities; trade; link to energy market	Traces specific market pathways to iLUC change	Uses externally specified average land-use, trade patterns, land cover, global land use dynamics
<i>Developers (Models*)</i>	US (GTAP ¹ , FAPRI ²) IFPRI, EC (MIRAGE-BioF ³) OECD (AGLINK-COSIMO ⁴) WUur (LEITAP ⁵) UBonn, EC (CAPRI ⁶)	E4Tech for UKDFIT (causal-descriptive ⁷)	Öko Institute (iLUC factors ⁸) Kloverpris & Mueller (Baseline time accounting ⁹)

methods: why is iLUC tricky to calculate?

iLUC GHG emissions from biofuels are not usually included in most of the LCA studies, **due** to the complexity and variability of the methodologies for accounting **this effect**. Models are evolving rapidly, getting better at capturing complicated links between agricultural, energy, and animal feed markets **forged** (?) through new biofuel policies and production.

MIRAGE-BioF, developed by IFPRI, is currently one of the most valued model for reporting iLUC GHG emissions. It encompasses all economic sectors and markets and their interactions at a global scale.

results: can biofuels really save GHG emissions?

Figure shows an example of the GHG emissions range of several biofuels if iLUC is considered. Both direct emissions and the savings with the standard fossil fuels from European Renewable Energy Directive (RED) 2009/28/EC are compared.

Compared to **other** modelling studies, as for example **the one** reported by JRC (EC 2010), the values have a similar range. This study reports feedstock specific values for biodiesel and bioethanol ranging from 14-337 and 19-151 g CO₂/MJ, respectively.

Differences between the values are due to several reasons, mainly related to the type of approach: consideration of increases in yields, credits for co-products, different types of substituted land, etc.

Figure 2. GHG emissions from biofuels, considering indirect and direct emissions (van Renssen 2011).

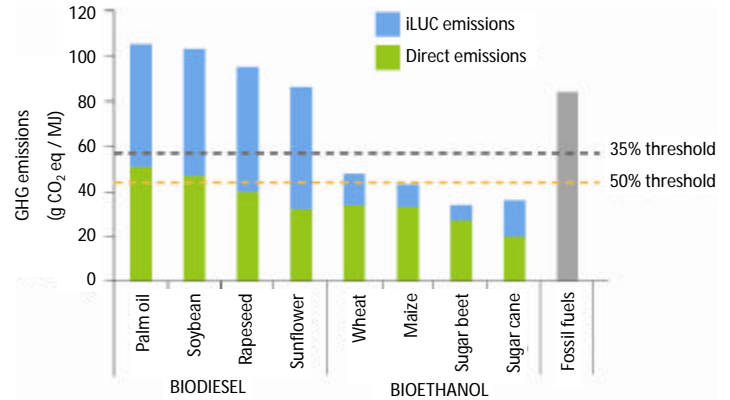
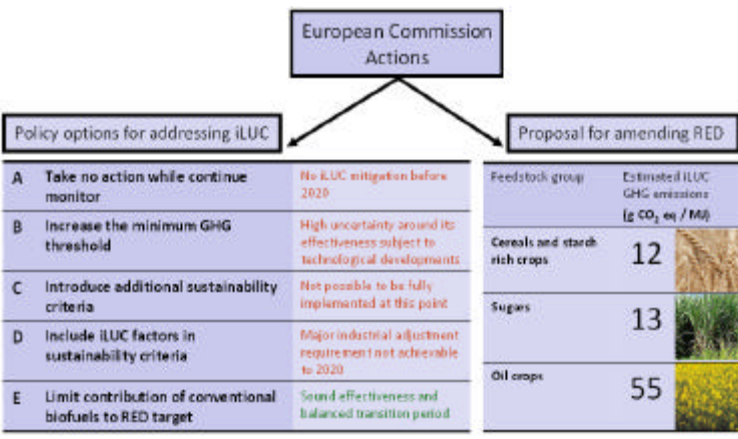


Figure 3. Actions developed by EC for addressing iLUC in biofuels policy and GHG value proposals (adapted from EC 2012).



conclusions & next steps: ...and what to do?

European Commission has done several expert consultations and developed corresponding actions for addressing iLUC component in LCA of biofuels. A proposal for adapting RED directive, to take into account the GHG emissions resulting from iLUC (**although only with informative purposes**), has been presented, after the evaluation of possible approaches (by end-2012).

Many comments and amendments to the estimated values **have** been done by stakeholders (EU Governments, researchers, NGOs, etc.), so this issue is currently being debated.

Next steps of this work, to be completed by end-2013, are the following: i) a detailed study of the MIRAGE-BioF model and the main characteristics of the rest of the models, and ii) application of models to the current Spanish biofuel production.

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