ILUC-free Biofuels

Briefing prepared by Zoltán Szabó, PhD *Jan 2015*

Introduction

Indirect Land Use Change (iLUC) impacts of biofuel production have been an important topic for scientific research. Policy making in the EU increasingly recognizes the concept. Nevertheless there is much inherent uncertainty and structural variability yet in modelling iLUC. Given that uncertainties will remain and science needs time to mature on the subject, the question necessarily arise as to why not advance mitigation in the meantime? Acknowledging that iLUC impacts of any biomass-derived product that uses additional agricultural feedstock or land (bioenergy, including biofuels and biomass heat or electricity, tobacco, sugars, etc.) are real, we believe policy effort should focus on proactively mitigating possible iLUC. Mitigating iLUC could bring immediate results. One of the ways forward for mitigating or even preventing iLUC is based on the concept of iLUC-free (or low-iLUC-risk) biofuels.

What are iLUC-free biofuels?

Three main types of iLUC-free biofuels

The two most important ways to produce iLUC-free biofuels are by productivity gain and use of under-utilised land. The former consists of two techniques, so overall there are three main types, as listed below:

1. Increasing productivity of land
    a. Yield increase of crops
    b. Multi-cropping
2. Cultivation on under-utilised (abandoned or degraded) land

In addition to the above three there are other options, but they are more complicated, thus are not covered here.

Definition and possible application of the concept

If bioenergy feedstock comes from above baseline crop yield increases, previously non-applied double-cropping, or cultivation on abandoned or degraded land possible iLUC impacts are mitigated. In fact, in these cases iLUC-free biofuel results.

When feedstock for bioethanol production comes from additional yields produced on the same amount of land (yield-increasing technique), and those additional yields would not have been produced otherwise (and thus iLUC models did not include this mechanism), there is no adverse land use change impact. Likewise, when an extra crop is produced in the same growing year in addition to the regular harvest, called double-cropping, surplus feedstock is produced that allows for bioenergy production with zero-iLUC. Bringing abandoned land back to cultivation or using degraded land will also result in extra feedstock with zero-iLUC. Abandoned or degraded lands tend to have lower productivity, nevertheless may be suitable for energy crops.

Scope of iLUC-free biofuels

The potential for iLUC-free biofuels in Europe is considerable. Yield increase potential and multi-cropping, as well as abandoned lands in Europe are substantial. The yield gaps in Central and Eastern Europe and neighbouring countries are particularly large.

A recent iLUC mitigating study (Wicke and Faaij, 2015)[1] finds large low-ILUC-risk potential. In four case studies the authors show that undesired LUC from biofuel targets can be prevented by the proposed technical measures for modernizing and sustainably intensifying the entire agricultural sector and by using under-utilized land for additional production. Not only is the iLUC-free potential larger than the projected increased demand due to biofuel targets, it is also larger than the increased demand without biofuel targets. Thereby, undesired LUC from all uses and specifically ILUC from biofuels can be prevented. For instance the potential for iLUC-free corn ethanol is three to ten times that of National Renewable Energy Action Plan target for bioethanol in Hungary in 2020.

Sustainable intensification of agricultural production

In the case of yield increase given that more feedstock will need to be produced from the same amount of land, and the need to not increasing the burden on the environment, how can more feedstock be produced sustainably? Godfray et al. (2010) offers sustainable intensification of agricultural production[2] as a way forward. Tscharntke et al. (2012)[3] use the term agroecological intensification.

The key is more efficient use of inputs and improved management techniques. It is not the fertilizer applied on land that contributes to nitrification but the volume not taken up by the plants. Technologies are readily available (i.e. precision farming, GIS), they are not a constraint. Yield increase can be achieved by improved fertilizer application, mechanization, better seeds, precision farming, irrigation, etc. In short it is possible that increase in production of feedstock does not imply the application of more inputs, thus the burden on the environment is not increased.

Multi-cropping technique can serve as winter cover crop to bring additional environmental benefits in terms of soil erosion and soil emission (GHG) profile of cropping.

Additional benefits

The greatest value of bioenergy systems is unlocked when the entire agricultural sector is considered, and bioenergy policies may play a key role in bringing investments, hence jobs, to agriculture. Bioenergy policies may stimulate agricultural investments necessary to create sectoral change and revitalize rural communities.

Conclusion

Biofuels do not have iLUC impact if produced from increased land productivity (crop yield increase or multi-cropping), or use of under-utilised (abandoned/degraded) land. The potential for iLUC-free feedstock is substantial in the EU. If iLUC mitigation policies are designed and implemented, EU bioenergy production will be the most sustainable globally, with benefits to climate, agriculture and jobs.

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[1] Wicke, B., Faaij, A. et al (2015): iLUC Prevention Project. Copernicus Institute of Sustainable Development at Utrecht University http://www.uu.nl/en/research/copernicus-institute-of-sustainable-development/research/energy-and-resources/potential-indirect-land-use-change-iluc

[2] "Producing more food from the same area of land while reducing the environmental impacts requires what has been called "sustainable intensification"." Godfray, H.C.J., et al. (2010): Food security: the challenge of feeding 9 billion people. Science 327, 812–818.

[3] Tscharntke, T. et al. (2012): Global food security, biodiversity conservation and the future of agricultural intensification. Biological Conservation 151 (2012) 53–59

iLUC-free Biofuels – policy application

Designing EU policy for iLUC-free biofuels

Latest policy efforts of 'low-iLUC-risk' biofuels

The common position of the Council of Energy Ministers (June 2014) introduces the concept of 'low-iLUC-risk' biofuels, i.e. biofuels from schemes that achieve productivity increases beyond business-as-usual may be considered low-iLUC-risk. Low-iLUC-risk biofuels were not proposed to receive any preferential treatment or incentives, so the next step may be to make use of the concept and adopt relevant measures. One of the ways is to release low-iLUC-risk biofuels from the proposed cap on conventional biofuels.

Note that the term low-iLUC-risk biofuels actually refers to biofuels with zero-iLUC impacts (iLUC-free). It is suggested that the term in policy documents is modified accordingly.

Principles of enabling and making use of iLUC-free biofuels

Certifying iLUC-free biofuel production and allowing it to contribute to the renewable energy target specified in Renewable Energy Directive is a promising way to bring climate benefits while mitigating risks. The following are some key aspects for any respective policy to consider.

Establishing baselines for the main types of iLUC-free biofuels

1. Increasing productivity of the land
   - Baseline to be applied for yield increase: historic average yields of the past 10 years. Any harvest above this trend line is considered iLUC-free.
   - Baseline to be applied for multi-cropping: qualifies if there was no multi-cropping practiced generally in 2008 or in the prior decade. Any harvest beyond the primary crop is considered iLUC-free feedstock.
2. Cultivation on under-utilised land (abandoned or degraded land used for production of bioenergy feedstock)
   - Baseline to be applied: arable land that was not in food/feed production in 2008 or in the prior decade (could include tobacco and other non-food crops), or land that is classified as degraded.

Some policy specifics

- iLUC-free biofuels from yield increases will be determined on NUTS levels (i.e. not farm level). Farm level will be used for abandoned/degraded land, multi-cropping and other iLUC-free pathways.
- All sustainability criteria specified in RED apply and an anti-land-grabbing criterion is added ("Bioenergy feedstock shall not come from land that in 2008 was the primary source of sustenance for a local community.").
- IFPRI (2011) will be used for reporting purposes to calculate the GHG impacts of biofuels produced between the 11.7 MToe IFPRI 2011 baseline and the actual amount of a cap on conventional biofuels. Alternatively, GLOBIOM 2015 can also be used. But in view of a stable regulatory environment this choice is not be left open.

Tackling the impacts of weather on yields

Weather has a large impact on the actual performance of conventional agriculture. Yields in general are highly sensitive to the pattern and magnitude of precipitation and the temperature distribution throughout the cultivation phase. Weather has the largest influence on any given year's yields. How then to determine whether there was a yield increase? It is necessary to look at interannual variability to smoothen the impacts of weather. Therefore for certification purposes a five year moving average will be used which will allow for a sufficiently robust estimate on yield trends.

Issuance of 'iLUC-free biofuels' certificates

ILUC-free biofuels produced from yield increase:

- In any given year iLUC-free biofuel certificates will be issued if corresponding NUTS level yields are higher than the baseline.
- To avoid possibilities of incorrectly issuing certificates, no certificate will be issued when yields are lower than the baseline.
- Each year certificates issued thus far will be aggregated and total iLUC-free volume is calculated and equated to above baseline volume. The aim is to tackle interannual fluctuations in yields.

For multi-cropping and abandoned/degraded land certificates will be issued based on farm level data, thus information on the actual performances can be monitored and verified in any given year, there is no need to consider averages or trends.

Criteria for the identification and certification of iLUC-free biofuels

A fund is to be set up to establish an effective policing mechanism to ensure the integrity of fuel certified as iLUC-free. The fund is to be financed by a low fee on certification (cca. 0.1 cent/liter). The management of this independent entity would consist of an experienced think tank, NGOs, and a trade expert, with the express mission to uncover both potential fraud and structural errors in the certification of iLUC-free biofuels, thereby ensuring the integrity and continued improvement of the scheme.