Response to EOA’s contribution to the ILUC modelling study

The Ecofys, IIASA, E4tech consortium received on 17 January 2014 a contribution from the European Oilseed Alliance (EOA) to the ILUC modelling study for the European Commission. In this document the consortium provides responses to the questions raised and comments made. Text copied from the EOA document is formatted in *italics*, responses by the consortium are formatted in blue.

1. **Behavioural parameters**

*The description states that the elasticity coefficients for modelling changes in food consumption are sourced from the USDA demand elasticity database, but it says nothing about how the coefficients for the other behavioural parameters will be sourced or derived.*

*The model description should provide details of how all of the behavioural parameters will be derived.*

**Response**: Only the demand side of the model takes elasticity values as direct inputs. The supply side of GLOBIOM is dependent on different conversion costs on for land use and non-linear cost of trade expansion or intensification. Elasticities corresponding to these parameters are therefore implicitly derived and can only be calculated through sensitivity runs. To ease comparison with other models, these runs will be performed in the course of the project and the corresponding elasticity values will be published on the transparency platforms.

1. **Model prediction timescale**

*It is very important that ILUC impacts are determined for biofuels that are currently being sold (as with direct GHG emissions).*

*Scenarios attempting to predict 2020 biofuel supply generate more uncertainty in the model which is impossible to be assessed or be taken into account in sensitivity analysis.*

**Response**: the goal of this study is to model ILUC effects for 2020 and 2030. However, as the start year of the analysis with GLOBIOM is 2000 and the model runs with time steps of 10 years. The current biofuel policy is reality (part of the baseline) and in this study we will model various future scenarios. We compare EU biofuel consumption without the EU RED with EU biofuel consumption with full EU RED implementation in 2020. ILUC effects of the increase in consumption will be modelled in various scenarios (feedstock specific, EU biofuel mix, increased use of EU abandoned land etc.)

1. **Crop rotation**

*Specific characteristics of crops and their impact over crop rotation should be implemented in GLOBIOM (e.g. rape acting as a break crop and allowing higher yields for subsequent wheat).*

**Response:** this effectis currentlytaken into account for production in Europe. The model explicitly represents rotations, and yield obtained for each crop within a rotation depends on the other crops used in the rotation. The set of crops in each rotation is also used to calculate the effect on soil organic carbon. All these calculations are performed using the EPIC crop model. Currently, we do not have the data on crop rotations that would allow us to apply the same framework in other regions on the world.

1. **Yield responses and intensification vs area changed**

*For ILUC modelling, we primarily need to know how much of the increased demand due to biofuels is met by increases in land area and how much is met by increases in crop yield. Accurate historic yield and area data is available from FAOSTAT and can be analysed to determine the relative proportions of increased demand that is met by increased yield and increased crop area The GLOBIOM model coefficients must be adjusted to ensure the GLOBIOM model results fit the results from analyses of historic data.*

**Response:** yes, the results obtained with GLOBIOM will be compared with historical data. However, it should be kept in mind that historical developments incorporate both time-driven effect and price-driven effect. Time-driven effects are present with the same magnitude in the baseline and scenarios. Price-driven effect can differ. The marginal effect of a shock only includes price-driven effect and therefore, these can be a source of difference with historical development.

1. **Fertiliser addition**

*However, crops and farming practices are being developed in order to use fertiliser more effectively, so there is not a constant historic relationship between fertiliser inputs and yields.*

**Response:** Each management system in GLOBIOM has its own fertilizer needs calculated by the crop model. But long term yield increase is also dependant on the rate of technical change and we do not assume a constant relationship between fertilizer and yield for the exogenous trend on yield. Our standard assumptions follows the historical average observation of an elasticity which is below 1, around 0.75, which means that an increase of 1% in yield is only associated to 0.75% increase in fertilizer. This coefficient can be increased or decreased depending on assumptions in the projections on the level of sustainable intensification in the baseline. But this is not explored and refined in this project because N2O emissions are not directly the scope of this study on ILUC.

*Since cultivation N2O emissions from fertilisers are already included in the direct GHG emissions calculation, inclusion of N2O emissions from cultivation in ILUC modelling will lead to double counting.*

**Response:** Change in N2O emissions associated to a biofuel policy can be very different from emissions only attributable to a biofuel crops. Double counting of soil N2O emissions should not intervene here because these emissions are not part of ILUC. If required, as for land use emissions, accounting for these emissions would need to remove the emissions already accounted in the life cycle analysis of the biofuel crop.

1. **Farmers changing management system & animals as a response to protein meal availability and prices**

*The assumption that farmers will switch between livestock management systems as a response to changes in the relative prices of feed materials is very unlikely. It is also unlikely to see a farm switching from cattle to pigs given the investment involved and technicality of these different types of livestock management.*

**Response:** This statement would deserve to be substantiated. We agree that in the short run and at a single farm level, it may be indeed unlikely. But in the long run, some farmers unfortunately quit the business or their farms are not maintained, whereas some others expand their production. At a macro level, this leads to a restructuration of the production and change in system composition. These transitions are part of the history of many regions of the world, for livestock as for crops, and profitability of farm activity significantly influence them.

1. **Changing protein/energy ratio in animal feed**

*The GLOBIOM model should be set up so that RSM displaces other components to precisely meet metabolisable energy and digestible protein requirements.*

**Response:** we agree on this point which is on our work plan and the representation of co-product substitution will be looked into in detail.

1. **Adjustment in supply of soybean**

*What is the main driver which triggers soybean production in the GLOBIOM model: demand for oil or demand for meal? Do high-protein biofuel co-products produced in Europe tend to reduce and replace soybean meal imports in the GLOBIOM model?*

**Response:** Both co-products of crushing have their market price in GLOBIOM. These two prices are determined by the price of seeds and the processing cost of crushing, but also by the demand for the different co-products. Demand for meal is explicitly represented in GLOBIOM and calibrated with the base year prices. Meal therefore is associated a value and livestock expansion drives demand for meals up. If the associated oil is oversupplied, its price is therefore relatively moderate. If some additional demand is introduced for oil, oil prices can go up, and meal prices can decrease in return if more oilseeds are being crushed. So both demand for oil and for meal determine the final demand for oilseeds. In such setting, the effect of an additional demand for vegetable oil is a decrease in meal prices and as a consequence some substitution with other feed products.

1. **Use of vegetable Oils : substitution limits**

*GLOBIOM model should use historical data in order to take technical limits for substitution between vegetable oils into account.*

**Response:** IIASA will work at improving the represent of the vegetable oil market following several comments from stakeholders and the advisory committee. We received some very useful input from different stakeholder on the use of vegetable oil markets and will try to make best use of this information. What determines leakage across vegetable oil markets does not depend only on average use and substitution feasibility, however; it also depends on marginal use and correlation of market prices, and model results will also reflect this.

1. **Avoiding overestimation of trade response vs local production**

*GLOBIOM should adjust parameters in order to be able to fit historic data for changes in demand, trade and regional supply*

**Response:** The model output will be compared with historical data to support the results.

1. **Type of land converted**

*The GLOBIOM model should be structured and coefficients chosen so as to be able to model the land use changes in the EU such as to:*

* *Include abandoned land as well as “not harvested” land as a separate land category, in addition to permanent grassland, cropland and forest*
* *Model the amount of additional cropland generated by a reduction the area of “not harvested” and abandoned land.*
* *Model the amount of additional cropland generated by a reduction in rate of land abandonment.*

*Coefficients for the proportion of additional cropland that is obtained by each route will need to be set up to match historic changes for each region.*

**Response:** GLOBIOM takes into account “not harvested” land and abandoned land. Under constant agricultural policy, abandoned land rate in Europe is determined by future EU and international demand and by yield growth trend. As historical development has shown, expansion of abandoned land showed loss of profitability of crop cultivation in a certain number of regions. There are different views on whether the economic conditions to resume the profitability of agriculture in areas where large abandonment occurred will appear in the future. Recent developments still show large abandoned areas. We will look at different scenario developments with respect to this trend.

1. **Carbon storage undervalued for palm plantations**

*Given the ILUC methodology of the models, rapeseed oil used for biodiesel is replaced through a succession of substitution by a certain share of palm oil. For this reason, any bias on the assessment of palm oil CO2 emission results in a bias on the EU rapeseed biodiesel ILUC. The fact that GLOBIOM seems not to include above ground carbon stocks as well as Soil Organic Carbon (SOC) of palm plantation could lead to a bias against all type of biodiesel.*

**Response:** inclusion of living biomass carbon stocks and SOC for perennials has been identified in the list of suggested improvements and is currently in discussion with steering group, advisory committee and stakeholders.

1. **Land reversion**

*For forestation, the GLOBIOM model should use rates of carbon accumulation for natural succession, rather than for afforestation.*

**Response:** we agree that afforestation and natural vegetation reversion are two different processes.Accounting of carbon flows related to forest reversion will be looked into more detail in the course of the project.

1. **Land reversion time**

*When recently abandoned land is converted to cropland, or land that would otherwise be abandoned for agricultural use continues to be used as cropland, the reversion time, rather than the amortisation period, must be used for determining the rate of change of carbon stock. From literature a reversion period of 100 years is appropriate.*

**Response:** we will look into this. For soil organic carbon, a period of 20 years is usually considered long enough to capture most of the change in soil (see IPCC guidelines). For living biomass, we currently plan to follow the approach from the RED that specifies carbon should be accounted on a reference period of 20 years for direct land use emissions.