

# GLOBIOM ILUC modelling Q&A

12 February 2014

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A consortium of Ecofys, IIASA and E4tech has been assigned by the European Commission to model ILUC emission values associated with conventional and advanced biofuels consumption in the EU. The GLOBIOM model developed by IIASA will be used and project results are expected by early 2015. The consortium aims for a high degree of stakeholder involvement in the project. Descriptive documents and (interim) results are published on [www.globiom-iluc.eu](http://www.globiom-iluc.eu) and throughout the project the [ILUC@ecofys.com](mailto:ILUC@ecofys.com) mailbox is open for questions, comments and suggestions. Also, a number of stakeholder consultation meetings are organised to obtain stakeholder input.

This document contains a summary of questions received from stakeholders and responses from the consortium, grouped per topic, to help increase the understanding of the GLOBIOM model. A description of the GLOBIOM model and comparison to the MIRAGE (IFPRI) model is published on the project website. In separate documents, the consortium (1) provides an Inventory of suggested improvements to the GLOBIOM model to be made during the project, (2) describes the proposed modelling baseline, feedstock and policy scenarios and (3) provides meeting minutes of the plenary Advisory Committee meeting. Suggestions from stakeholders on possible improvements of the GLOBIOM model are not listed in the present document but in the separate Inventory of improvements document.

No.	Question	Answer
<b>General questions about the process and scope of the project</b>		
1.	Who manages the project at the European Commission side?	The project is performed for DG ENER. ENER established a Steering Committee (SC) consisting of a large number of different DGs (around 6 DGs actively involved) who jointly discuss important decisions related to the project.
2.	How will the Commission use this study?	Our task in this project is to inform the Commission on emissions from biofuel production. The results will be made public but the Commission has not indicated how the results will be used.
3.	Do you give policy recommendations in this project?	That is outside the scope of this project. We want to explain the outcomes, uncertainties, etc. and provide the context of the figures.
4.	What is the planning of the project?	The inventory of improvements containing the stakeholder input is currently reviewed with regard to the feasibility of incorporating the suggestions into GLOBIOM. The decision on improvements to be integrated will be made in March 2014, after which IIASA will implement the improvements in March-July. During this period, data will be collected to support the model improvements as well as the baseline and scenario design. The consortium will start modelling in September 2014 with final results expected in early 2015.
5.	When are stakeholders involved?	All stakeholders are invited to provide input and feedback which can benefit the study. Relevant project updates are circulated among a wide range of stakeholders and publish on <a href="http://www.globiom-iluc.eu">www.globiom-iluc.eu</a> . Stakeholder meetings are held with many stakeholders who broadly fit in four main categories: the bioethanol production chain, biodiesel production chain, advanced biofuel producers and NGOs. A first series of consultation meetings has been held in November 2013 at which the GLOBIOM model was discussed and stakeholders provided suggestions on how it could be further improved. A second stakeholder consultation will be organised in February 2014 during which a proposal for model improvements will be discussed as well as a proposal for a modelling baseline, feedstock choice and policy scenarios. Throughout the project, the <a href="mailto:ILUC@ecofys.com">ILUC@ecofys.com</a> mailbox is open for questions, comments and suggestions from stakeholders. Stakeholders will be invited to a meeting on project results probably in early 2015.
6.	Who will decide on the choice of baseline assumptions and choice of feedstocks and scenarios used in the modelling?	The consortium will prepare a proposal for a baseline, feedstock choice and policy scenarios, based on the project Terms of Reference and on feedback from the stakeholder consultation. These proposals will be discussed with the Advisory Committee and with the EC Steering Committee. The Commission and the consortium take decisions; the AC has an advisory role.
7.	What is the scientific Advisory Committee (AC) and what is its role?	The consortium established a scientific advisory committee consisting of international experts on modelling and agriculture. The role of the Advisory Committee is to provide input to and advice on

No.	Question	Answer
		<p>how the GLOBIOM model could be improved, how the model should be used and how sensitivity analyses should be designed. While the project consortium appreciates the important role of the Advisory Committee, it should be noted that all decisions concerning the project will be taken jointly by the European Commission and the project consortium. This means that it is not necessary for the Advisory Committee to reach agreement or unanimity on its advice.</p> <p>We have three meetings with the AC: i) a round of individual interviews with AC members to obtain their thoughts on the GLOBIOM model and how it should be used, ii) a meeting to discuss the suggested improvements to GLOBIOM and proposed modelling baseline, policy scenarios and sensitivity scenarios and iii) a meeting to discussing draft modelling results, after which some additional modelling is possible. The AC mission statement is available at <a href="http://www.globiom-iluc.eu">www.globiom-iluc.eu</a>.</p>
8.	Who sits on the Advisory Committee?	The AC consists of: Richard Plevin, Jacinto Fabiosa, Koen Overmars, Andre Nassar, Robert Edwards, Chris Malins David Laborde, Prem Bindraban and Don O'Connor. Alexandre Gohin has been temporarily AC member.
9.	How is the Advisory Committee formed?	The AC was established to provide scientific advice. The consortium looked for academics with relevant expertise on modelling and agriculture/land use. Also, members could not be directly affiliated with industry or NGO stakeholders in ILUC debate. The consortium proposed names and discussed these with the European Commission project Steering Committee. Early in the project, the consortium and SC received requests from NGOs and industry to expand AC membership. This request has been accepted and two additional members were asked to join the AC (Prem Bindraban and Don O'Connor). During the process of selecting additional members, Alexandre Gohin was temporary AC member.
10.	Do you intend to let the Advisory Committee review your modelling results?	An AC meeting will be organised to discuss draft modelling results. Following this meeting, additional modelling is possible. A full peer review is not part of the current project scope but could be a possible additional task following the current project.
11.	Are you aiming to develop a new methodology for GHG calculation or do you aim to develop a methodology that is in line with the current EU RED GHG emission calculation rules?	The Renewable Energy Directive contains rules to calculate GHG emissions from the biofuel production and supply chain as well as emissions caused by direct land use change (dLUC). The ILUC modelling project models total land use change (dLUC plus iLUC). ILUC factors could be derived by deducting dLUC (calculated in accordance with RED Annex V, part C) from the model outcome.
12.	Your project focuses on modelling GHG emissions from LUC, which is only one of many sustainability effects of biofuels production. Project results can be used for policy making purposes by the Commission. How can you ensure that your results are qualified and will you raise	The consortium will describe the exact scope of the project in the final report. The study will provide a lot of interesting and relevant results in addition to GHG effects; Many GLOBIOM variables that allow for looking at other dimensions (fertilizer use, water requirements, etc.) will be made available in the report.

No.	Question	Answer
	attention to other sustainability effects?	
13.	Will ILUC factors be modelled for additional EU biofuels consumption or for the entire EU biofuels consumption?	We will model ILUC emissions over the additional increase in EU biofuels consumption, which will be 3.3%, this quantity of biofuels will not be part of the 'biofuels shock'. Feedstock-specific LUC emissions which will be presented in grams of CO <sub>2</sub> equivalent per MJ of biofuel for each of the biofuel pathways included in our study, as well as the total amount of LUC.
14.	In addition to feedstock specific ILUC figures do you also calculate region specific figures?	For the moment we aim for feedstock specific figures only.
15.	How was the GLOBIOM model developed?	The GLOBIOM model has been developed by IIASA since 2007. It is a relatively new model but the GLOBIOM methodology is not new since GLOBIOM belongs to the same family of models as US FASOM, which has been used by EPA for its Regulatory Impact Assessment of the RFS in 2009-10.
<b>Trade, Commodity prices</b>		
16.	Export figures may change in case biofuels mandates change. How do you incorporate this type of changes?	Some biofuel policies will be incorporated in the baseline and influence trade in feedstocks and biofuels. Additional changes will be included in the scenarios which also impact this trade.
17.	Different price levels exist in the supply chain, the price paid by final processors will be different from the price paid to the farmer. Do you use farmer price plus processing cost?	GLOBIOM does not explicitly represent all price levels across the supply chain but represents the price increase between raw product and processed product. For products internationally traded, transportation costs and tariffs are also taken into account.
18.	The difference between farm prices and traded prices is significant; this difference was an issue with the IFPRI study. Does GLOBIOM account for this difference?	Currently GLOBIOM does not account for this price gap explicitly; in order to do so we would have to include all local transportation costs in the global version of the model. This type of approach has already been used in several regional studies, but applying it at global scale currently makes the model too slow to run. Although it remains a long term modelling objective for the development of GLOBIOM, it will probably not be part of the current project.
19.	How does GLOBIOM does represent the impact of agricultural prices on food demand?	Food price changes are included in the model and food demand therefore reacts to price of each single product. It is therefore possible in GLOBIOM to calculate how much kcal per capita are consumed per day for different products and how this is affected by price changes. One feature that GLOBIOM currently misses is the substitution between different products on demand side, which means consumption of one good is influenced by the price of another good (to substitute it). This point has been added to the list of possible improvements and IIASA develops ideas on how to capture this effect.
20.	GLOBIOM does currently not include horticultural land. How do you address this?	GLOBIOM does not currently have geographically explicit data on products from horticulture, which therefore is not modelled explicitly. Rather, assumed land use for horticulture is kept constant. This sector uses high value land and it is not expected that this will be easily displaced.
<b>Feedstock considered and data sources</b>		

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21.	Are land-based algae included?	No. Such algae are not available on commercial scale and it is unclear which technology will be the most commonly used in the future (raceway pond or photo bioreactor) which makes it difficult to develop a credible scenario.
22.	How is roundwood in the G4M model defined and where is the data taken from?	The G4M model represent different types of wood: Industrial roundwood is defined as stemwood that is suitable for industrial purposes (sawlogs, pulplogs and other industrial roundwood). Harvest losses and non-commercial roundwood are defined as stemwood that is unsuitable for industrial roundwood, but can be used for energy wood or traditional household fuelwood. The difference between harvest losses and non-commercial roundwood is that the former has unwanted stemwood sizes, while the latter has unwanted tree species. The amount of harvest losses is based on G4M model estimates and is about 20% of the increment and varies depending on aspects such as harvest systems, soil quality, and slope. The share of non-commercial species is based on FRA (2010) data on commercial and non-commercial growing stocks.
23.	Is black liquor included in GLOBIOM?	Yes the production is covered in GLOBIOM, but currently nothing is going into biofuels, so there is no biofuel pathway represented for this feedstock in the model.
24.	Is corn silage included in GLOBIOM?	Yes, corn silage is included in GLOBIOM. It remains to be seen how to best represent a bioenergy pathway for this feedstock.
25.	Is Arundo donax also included in GLOBIOM?	Arundo Donax is not included in GLOBIOM, two other grassy crops are represented: miscanthus and switchgrass.
26.	How do you decide how much feedstock is available for advanced biofuels in the G4M model?	The G4M estimates forest growth, potential harvest amounts, changes in carbon stock and changes of forest area. Only sustainable management regimes of forests are considered (with the exception of deforestation) and the final harvest rate is based on the price of wood. G4M production data is then used in GLOBIOM that allocates the use of harvested wood. Wood resources that are not being used for material production (non-commercial roundwood, branches, etc.) can be acquired for energy production without competition, while wood resources commonly used for material production (sawn log, pulplogs, etc.) can also be acquired for energy production if their willingness to pay is high enough.
<b>Land availability, (changes to) area harvested</b>		
27.	How does GLOBIOM take new land expansion into account?	Expansion on agricultural land is currently based on suitability of new areas, production and land conversion costs. Each grid-cell has therefore a different potential for production and the model determines if expansion is profitable in that area. Some policy constraints can also be taken into account through conversion possibilities or associated costs.
28.	Does GLOBIOM represent unused land?	GLOBIOM does have a fallow land category which contains fallow land as part of crop rotation in the EU. In addition, GLOBIOM has a 'other natural vegetation' category which includes abandoned

No.	Question	Answer
		farmland. It is difficult to decide exactly which land is abandoned farmland which could be used for agriculture in the future.
29.	How do you incorporate the effects of degradation of land following intensification of the system?	This is not accounted for yet, work on this topic is ongoing at IIASA.
30.	It would be good to acknowledgement that models and datasets cannot capture accurately the availability of unused land. Classifying land as unused which is available for biofuel production could have social consequences for local populations. Does GLOBIOM represent this?	The consortium is aware of the uncertainties related to unused land, see previous question. A large project at IIASA aims to compare and reconcile three global land cover datasets and verify the information with satellite data and crowd sourcing exercise. Steffen Fritz (IIASA) is leading this exercise ( <a href="http://www.geo-wiki.org">www.geo-wiki.org</a> ). But today, the state of the information is not satisfactory. GLOBIOM uses the Global Land Cover 2000 dataset. The consortium wants to be prudent and if land is classified as 'unused land' it does not mean necessarily that it will be cultivated in the model, because there are some conversion costs. The consortium looks at historical developments to understand the constraints of conversion. Note that set aside land is not a separate land type in GLOBIOM but is incorporated directly in the rotation as a dynamic land management pattern. Ecofys looked at Mozambique (for Low Indirect Impact Biofuels methodology, <a href="http://www.liib.org/the-liib-methodology">http://www.liib.org/the-liib-methodology</a> did not find unused land there, rather underused land. Unused land is probably available in Central and Eastern Europe. It is clear that large areas of unused land exist in Romania, with land owners moving to cities or abroad. It is difficult to classify all land correctly as for example in the EU abandoned farmland is often classified as agricultural land and ploughed annually in order to obtain EU subsidies. We will point out this uncertainty in our report. At the same time, we intend to develop a policy scenario in which abandoned or marginal land can be used to some extent.
31.	What are the factors that you will use for the calculation of the land conversion costs? Selling the timber is already profitable; IFPRI assumed only managed forests were converted to crop, which have lower carbon stock than primary forests.	Conversion costs are not a type of data for which you would find a consistent global database for all regions. To calibrate our conversion costs, the consortium therefore uses qualitative information on the hierarchy land use conversions that are observed. IIASA will then compare land dynamics with historical data. Expansion into managed or natural forest is controlled through the possibilities of the land transition matrix (figure p. 25 of the GLOBIOM/MIRAGE BioF report).
32.	FAO-statistics do not reflect physical hectares so "area harvested" is presented in a limited way and probably your modelling of area harvested cannot rely on FAOSTAT alone.	In GLOBIOM we use for our definition of cropland an area that is larger than the harvested area, based on two datasets different from FAOSTAT: CORINE Land Cover database for Europe and the Global Land Cover 2000 data for the rest of the world. These datasets provide land cover information as physical hectares. For most regions harvested area is lower than cropland data from GLC 2000, including regions with multiple cropping (not taken account in the current version of the model). The difference between harvested area from FAOSTAT and physical area of cropland is well identified in the model and is accounted for as unused cropland. However, there

No.	Question	Answer
		is always a high uncertainty on whether this land can really be cultivated. This uncertainty can only be reduced with when better data becomes available.
33.	What is the trigger for change in production in GLOBIOM?	Production in GLOBIOM reacts to prices, which are determined by the equilibrium with the demand for food, feed and other uses. When population and growth require more production, price increase, which leads to some expansion in area and some increase in yields, for domestic regions, but also some imports from other regions. Productivity is driven by an exogenous trend in the baseline that represents technological change and an endogenous trend that is determined by prices.
34.	How does the area harvested react to changes in yield that have been observed over time?	An exogenous technical change trend that is consistent with past observations is included in the baseline so yield improvements over time are accounted for and have a direct effect on land requirement.
35.	Does GLOBIOM account for double cropping?	This is technically very challenging, good information is needed on where it happens and why. We currently have a knowledge gap on this point and all relevant information is welcome. The consortium is currently reflecting on how to include double cropping in the modelling baseline.
36.	Could subsistence farming change to other management?	No, subsistence farming is kept constant in the modelling baseline, but low input systems can change to high input.
37.	Do you cover only “no go” areas of the directive (from sustainability criteria) or also beyond?	Protected areas are represented in the model. This information is sourced from the World Database on Protected Areas. This is a different definition from the “no go” areas from the directive. However, areas from the WDPA correspond to those effectively protected by national legislations. The sustainability criteria from the renewable energy directive does not prevent the “no go” areas to be affected by other agricultural production or even biofuels consumed by other regions. Therefore, adding the EU sustainability criteria only has little effect on the overall land use change dynamics, except if these areas are targeted by a specific local legislation. .
<b>Price induced yield increase, yields, land management and processing technology</b>		
38.	Will you use the same price demand elasticities as IFPRI?	We have compared elasticities with many other models and the elasticities in GLOBIOM can be found in the middle of the range. In the short run effects are however expected to be much more inelastic but for GLOBIOM we consider the long run adjustments. Of course, if we receive substantiated evidence that these parameters should be reconsidered, we will look at them carefully. Price demand elasticities will anyway be subject to a sensitivity analysis.
39.	Are yield elasticities specified per crop in GLOBIOM?	Yes they are. The consortium considers including tables in the final report with yield increases over time per region and crop. Also, our aim is to use the most realistic yield elasticity figures.
40.	Are there increases of yield because of biofuels above the background yield? In IFPRI they were quite affected. How does GLOBIOM do this?	Yes, modelling with GLOBIOM will have a similar effect because yields respond to price changes in GLOBIOM. However, some sensitivity analyses will be performed on this and the ILUC effect will

No.	Question	Answer
		be decomposed into its different component (yield response, demand response, co-products). Choices will be justified but uncertainty on this parameter is difficult to reduce.
41.	Which technology is used for the shock? By the time the report is ready, the technology will have advanced. How is that addressed? As part of the sensitivity analyses?	It is unsure what the future will bring: will the use of the current biofuel production capacity be optimised, or will there be expansion of new, more efficient installations? The choice of the full list of technologies to assess will be discussed, stakeholder input welcome.
42.	What is it the real driver for farmers that decides what crop they use and how do you incorporate that in the modelling?	GLOBIOM uses an optimisation under constraints approach at the grid level. This means that as a starting point, production costs are calculated to match the current production patterns, as observed in the allocation model SPAM and for EU, as specified by the rotation model CropRota. When these costs are calibrated, farmers replicate the calibration year as the results of optimisation behaviour. If crop prices change, as a result of a change in demand for instance, profitability of the different crops is changing and farmers allocate their land differently across crops, and/or expand cultivation if it is also profitable to expand.
<b>Product and co-product substitution</b>		
43.	How do you allocate GHG emissions for co-products and residues?	Allocation is an issue that comes up when a causal descriptive modelling approach is used. In this project, a partial equilibrium (PE) modelling approach will be used. This means that the net effect of additional demand for a specific feedstock is modelled, i.e. the model calculates the additional co-products following this additional feedstock demand as well as its resulting cascading effect across the supply chain and land use. For instance, increasing demand for rapeseed oil will lead to additional production of rape seed but also additional production of rapeseed meal. Extra production of rapeseed will have impacts on cropland side but extra meal will also have some effects on what livestock is eating, the need for grassland and on final demand on the meat market. The final GHG emission estimate for a feedstock specific supply chain is therefore the net result of all co-product adjustments and their associated effects. The potential land savings by using co-products is automatically taken into account.
44.	The way feed and its protein content was modelled in IFPRI was criticised. How do you treat this in GLOBIOM?	Feed requirement is calculated in GLOBIOM for the initial year using a digestibility model that takes into account all the different nutrient requirements of animals. When protein meals are produce, we can then account for their substitution on a protein content basis. This is done using substitution rations similar to what is used in LCAs or, more sophisticatedly, by accounting directly in the model for some substitution of nutrients, both on protein and energy content basis.
<b>Changes in food consumption</b>		
45.	A reduction of food consumption due to a biofuel induced increase in commodity prices can have a large impact on ILUC emissions. What parameters will you check? In the IFPRI study it was assumed that a	In the baseline, food consumption will grow (following population and GDP growth). Due to the shock and price effect of that on food consumption, a reduced increase in food consumption can be expected. We will make the contribution that reduced food consumption has on the modelling

No.	Question	Answer
	lot of ILUC was avoided by food consumption reduction. That goes against food security policies. How is that reflected/assumed in GLOBIOM?	results explicit in our report. Note however that a reduction in level of food consumption in the model is not necessarily a reduction in food to mouth only. Waste, change in diet, composition of processed food etc. are also part of the adjustment.
46.	Does the model calculate waste, diet, composition of food etc.?	The model takes these parameters into account in the baseline. Different assumptions can be made on waste levels in the baseline for instance. However, data availability is limited (FAO data does not identify the total waste in the food supply chain). Assumptions on future diet are also an important dimension for future land requirements. The effect of prices applies on all these components of food demand.
<b>GHG emissions, Soil Organic Carbon</b>		
47.	What sources of GHG and ILUC emissions do you include for forestry products?	The carbon stock in living biomass is accounted for in GLOBIOM for forestry activities. Higher demand of forest products lead to conversion of unmanaged to more managed forest, without further land use change. But land conversion can also produce short rotation plantations with change in carbon stocks (carbon pool releases and carbon sequestration).
48.	Will you include effects from forest degradation? If more woody biomass is used for biofuels this may increase. A study from CIFOR shows that 50% of forest degradation is the result of logging industry. Currently no restrictions exist on type of wood feedstock used, how will you construct your scenarios pertaining to this?	Currently all types of woody biomass can be used for biofuels in the model but we do not model illegal logging. Deforestation is represented through the effect of agricultural land expansion and forest degradation is not represented for the moment in GLOBIOM (modelling challenges due to local drivers and problem of data availability on current state of degradation).
49.	GLOBIOM uses IPCC tier 1 data for some land types, you propose to use another source for peat land. IPCC produces a new report end 2013, would not that be the best source to use?	The consortium will assess the new IPCC report and will be cautious on which peat land drainage emission values to pick. A literature review will be performed and experts are consulted to determine the most plausible ranges of emission factors.
50.	How do you calculate the emissions from different management systems? Which data will you use in the model?	For crops, the modelling takes into account N2O emissions using the crop model EPIC and information on the management from the allocation model SPAM (IFPRI), also reconciled with other datasets (International Fertilizer Association). CH4 emissions are also accounted too for rice based on FAO emission factors. Soil organic carbon is included only in the EU using data from JRC. The AC suggested sources to extrapolate this source to the rest of the world. New data is becoming available although collecting precise estimates remains a challenge.
<b>Baseline and scenario assumptions (taking into account existing and future policies)</b>		
51.	What will be the base year of the baseline?	Base year calibration is 2000. Some important dataset in the structure of GLOBIOM are indeed only available for the year 2000 (geographically explicit data), which prevents calibrating the full model in 2010. The baseline is subsequently calculated with exogenous drivers (population, GDP, technological change, biofuel policy in the rest of the world, on the period 2000-2030. EU biofuel policy scenarios are then added to this baseline and compared to the same situation without such

No.	Question	Answer
		policy. Because we now have good statistics around the year 2010, development in the baseline on 2000- 2010 will be compared with historical data.
52.	What will be the level of biofuels demand in your baseline and what will be the demand level in your 2020 and 2030 scenarios?	The baseline will include biofuel mandates in relevant non EU countries plus the EU biofuels consumption without the current policy (level 2008). In order to enable comparison with IFPRI, a baseline EU biofuels consumption of 3.3% is proposed. We will shock the baseline with several policy scenarios. We intend to model feedstock-specific scenarios individually, as well as an 'EU biofuels mix' scenario and a scenario which takes into account the proposed 5% cap on conventional biofuels included in the Commissions ILUC proposal. The EU biofuels mix scenario will model an assumed biofuels mix in 2020 plus an assumed mix in 2030. See also our separate document on Baseline and Scenarios, published on the project website.
53.	Will you apply a biofuels shock for 2030?	Yes, the consortium will model increases in EU biofuel consumption in 2020 and 2030. Assumptions on the baseline and scenario details will be communicated in a separate document and discussed with stakeholders.
54.	What will be the assumed size of the biofuel policy for 2030?	This will be discussed with the Commission Steering Committee.
55.	Which emission allocation period will you use, 20 years as IFPRI did or 30 years as US modelling studies do?	The consortium is not bound upfront by using a 20 year allocation period; however such a period makes sense as it fits with the 20 year allocation period for direct LUC emissions in the RED and FQD and it would enable easy comparison with the results of the IFPRI study.
56.	In recent years we saw a decrease in cropland availability in the EU. Is that accounted for in the baseline of the model?	This decrease is indeed a fact and has different causes. Some agricultural land is used to build new houses, roads and industrial estates; this land is no longer available for agriculture. Some land is turned into nature as a means of compensation for infrastructural development, as required by the EU. Some land, finally, is abandoned due to changing economics and could be available for future biofuel crop production. Such a decrease in cropland can also occur in GLOBIOM. One of the reasons for instance is increase in yield that leads to a decrease of harvested areas if demand does not grow as fast as yield. Land abandonment can also be driven by policies, and some of them can be added if necessary.
57.	You stated you will model current policies, but what about future policies? Is modelling different policies part of this project?	We will use the current legislative framework as a starting point. If we have strong indications that certain policy changes will probably be implemented, we could consider them.
58.	Are Natura 2000 areas included in protected areas for Europe?	In GLOBIOM we currently use the world protected areas database (WPAD) provided by UNEP. These areas correspond to areas that cannot be converted to agricultural land. Natura 2000 are not included in the WPAD database because agricultural activities are allowed for them, even if subject to some more stringent environmental measures.
59.	What is the assumption with respect to possibility of mandatory three crops rotations?	The consortium will look at that policy but is not sure what assumption should be made if the policy is not in place today. Technically, it would be possible to implement this type of constraints

No.	Question	Answer
		whether to include it in the modelling baseline.
60.	Will the project take into account EU set aside land of agricultural policy of 5% , maybe even increased to 7%?	Individual farmers have to leave 5% of their land aside as ecological focus area. This 5% will be included in the modelling baseline. An increase to 7% is no longer foreseen however in reality more than 5% will be set aside. Note that the ecological focus area requirement will not lead to a decrease in EU farmland with 5% since certain categories of land such as fallow land count as ecological focus areas.
<b>Access to the model and validation of modelling results</b>		
61.	Is the GLOBIOM model accessible and reproducible?	Transparency is a core aspect of this project and we will provide information on model assumptions, parameters used and results. However, IIASA does not envisage publishing the GLOBIOM code online in the context of this project. A high level of modelling experience is needed to run this model and its development is currently limited to IIASA and its collaborating scientific institutions in the framework of IIASA coordinated research. The consistency of the model results will be warranted by the full access to the model results and parameterization and the clear communication on how different results decompose and effect interacts. We will carefully consider any request for further clarification of some specific results if needed.
62.	Do you intent to validate results against historical data or do you use a different methodology for past and future?	The present study will compare the model results with historical development as a first consistency check. A more comprehensive validation of GLOBIOM goes beyond the scope of this specific project. IIASA is involved in different model comparison exercises to compare model responses on specific scenarios (e.g. AgMIP, <a href="http://www.agmip.org">www.agmip.org</a> ). Also, IIASA collaborates with some regional teams in different deforestation hotspots, in particular the Congo basin and Brazil, to improve the representation in GLOBIOM of land use change in these regions. Trends in land use remain complex however, because they are shaped by market mechanisms and also by national and local policies. IIASA continuously works to improving the model.
63.	Can stakeholders be involved in the actual modelling and run their own scenarios?	Stakeholder consultation is an important part of the project. Stakeholder input feeds into decisions on how to improve GLOBIOM and how to design the baseline, feedstock choice and policy scenarios. We envisage modelling several 'optimistic' and 'pessimistic' scenarios in addition to the central scenario. The actual running of modelling will be done by IIASA. In order to increase the possibilities for stakeholders to gain insight in the modelling, the consortium will construct a Graphical user interface (GUI) which presents modelling outcomes for several scenarios. It would also be possible to construct a more sophisticated GUI webtool which allows stakeholders to see the impact (in grams of CO <sub>2</sub> eq per MJ) when the improved GLOBIOM model is run with lower or higher input values for certain key parameters. Lower and higher input values would be based on the inputs used in Monte Carlo analyses performed in the project.

No.	Question	Answer
		Whereas constructing the 'simpler' interface is part of the current project, the more sophisticated interface would require an additional effort.