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European Commission Consultation on Indirect Land Use Impacts of Biofuels – October 2010

Appendix 1: Comments on the Study "Global Trade and Environmental Impact Study of the EU Biofuels Mandate" (IFPRI paper)

The paper was prepared by the International Food Policy Research Institute (IFPRI) for DG Trade. It attempts to calculate the effect of the EU 2020 biofuels target on changes in trade, land use and GHG emissions as a result of Indirect Land Use (ILUC). The model used for this work is a modified version of the Global Trade Analysis Project (GTAP) model.

Comments on Model

The GTAP model was not specifically written to model agricultural trade or ILUC changes. While IFPRI have made some modifications to the model to enable improved modelling of some aspects of ILUC, these changes fall short of those required to give reasonably accurate results for ILUC factors. While the paper describes IFPRI changes to the GTAP model structure, no work has been done by IFPRI to determine appropriate elasticity coefficients and other model parameters for this application. In many cases arbitrary figures have been used for these factors, with no justification for the values that have been used.

Specific comments on the model are given below:

Transparency

In order to check the validity of a modelling approach, or to understand why different models give different results, it is important to know the justification for the modelling approaches that are adopted, the data fitting processes and data that have been used to determine parameters, for example elasticities, in the model.

IFPRI do not provide any of this information. Although the database and source code for the GTAP model is available on the internet, this does not provide the data needed to justify the models. Some examples of the transparency issue are listed below and explained more fully under relevant sections.

- Lack of justification of modelling approaches: assumption of constant yield growth rate and use of Armington elasticities for changes in trade patterns of cereals.
- Reference sources for the GTAP model elasticities factors are not provided in the database.
- Lack of a firm basis for assumptions: the elasticity used to account for lower yield on new land used to grow biofuel crops in the GTAP model is justified by "best judgement".

Predictive ability of model

For model predictions to be trusted, the models need to be validated, by demonstrating that back testing predictions of past perturbations in crop yield growth rates, crop land and grassland areas, trade flows etc satisfactorily match those observed. This has not been done for the IFPRI model. At the minimum price elasticities used within the models should be validated against historic data for relevant crops and regions. There is no evidence that this has been done for EU crops or indeed any crops for any of the elements of the IFPRI model.

Fuel Use and Crop Supply

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The report assumes a constant 45/55% biodiesel/bioethanol split, so when the share of first generation biofuels rises above 5.6% of the fossil fuel energy content, this will have an adverse effect due to the poor ILUC effects of biodiesel feedstocks, this assumption leads to the model showing a total ILUC factor that appears to increase non-linearly with increasing biofuel use, when in fact the behaviour for each biofuel pathway is roughly linear and it is this change in fuel split that causes the apparent nonlinearity in the model.

As the executive summary makes highlights on page 11 the study is based on a very specific set of production assumptions that:
"The required increase in biodiesel production is mostly domestic in the EU while the increase in bioethanol production is mostly concentrated in Brazil. It implies a considerable increase in EU imports of bioethanol, despite the duties."

The biodiesel market in Europe is more developed than that for Bioethanol not least because the lesser infrastructure and technical requirements for low blend volumes of biodiesel combined with low overall mandated biofuel content in the existing fuel supply chain. The increase in the mandated biofuels content in liquid transport fuels over the last few years and into the future with the Renewable Energy Directive (RED) has necessitated the development of bioethanol in the petrol supply chain in addition to the currently more prevalent biodiesel supply chain to meet the targets.

The study appears to take the view that as there is very little existing domestic EU bioethanol production capability therefore we will import bioethanol (from Brazil). This ignores the situation that RED has help create a defined legislative framework for bioethanol demand and this has in turn allowed many new ventures with in Europe to realistically seek (and secure) the funding they needed to start construction of bioethanol production facilities which can take several years to come on line and in many cases use or seek to use feedstock from local EU domestic sources; in northern Europe feed wheat or sugar beet and in southern Europe maize. Demand for feedstock will take time to come on stream therefore the incentive to increase feedstock production above existing levels (via increase in yields or land area) will take even further to occur.

We believe that these new plants will help to increase demand for locally produced cereals which will counteract the yield loss predicted in section 4.2.4 due to the end of the set-a-side policy, and will also help to sustain or improve investment in agriculture in contrast to the study and promote yield growth at the rate above the minimal suggested in section 4.2.2, an example of this investment in agriculture can be seem with several UK companies each investing over the last few years and planning to continue to invest several tens of millions of Pounds in the Ukraine to grow wheat and oilseed rape (e.g. LandKom PLC). Most of this investment as been in capital equipment as they can only lease not purchase the land under current Ukrainian law.

We that believe that the study should also take account alternative scenarios based on higher future EU domestic bioethanol production as there are an increasing number of parties and plants in the sector, and the impact on trade and the environment. We acknowledge it is always difficult to assess and model fast growing sectors and that the sensitivities would be particularly large but that an assessment of a likely but difficult to model outcome is highly desirable.

It is becoming more widely accepted that over time and with higher biofuel usage, the split of bioethanol to biodiesel will increase because:

- Most biodiesel production has higher direct GHG emissions than most bioethanol production, so will be more restricted by higher GHG emission thresholds coming into force in 2014, 2017 and 2018.
- Vehicle technology for spark ignition engines has improved significantly, such that the drive to reduce CO2 by a dieselisation trend will slow as new spark ignition engines, with lower vehicle costs, rebalance the market, particularly for smaller engine vehicles.

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- The prices of vegetable oils will need to increase more rapidly than cereal prices, due to the substantially higher growth rates required for vegetable oils than cereals to meet the 2020 biofuels target.

The assumption of a constant 45/55% biodiesel/bioethanol split, compared to a higher bioethanol energy share increases the GHG emissions associated with ILUC

Accounting for high protein biofuel co-products

The IFPRI model does not properly take account of high protein bioethanol co-products such as DDGS. While it is assumed that oil meals replace each other on the basis of their protein content, it is assumed that DDGS displaces cereals on an energy basis. Yet the protein content and digestibility of wheat DDGS protein is higher than that of rape and sunflower meal. A basic understanding of animal nutrition dictates that in the EU using these co-products in formulated animal feeds will replace a mixture of marginal cereal and soy meal to maintain the energy and protein balance. It is understood that the structure of the GTAP model simply does not allow high protein cereal co-products to replace high protein oil seed co-products and that there has not been sufficient time to correct this fault. The GTAP model therefore is not able to model the substantial displacement of soy meal imported to the EU and the ILUC credit associated with the reduced rate of soy expansion. The lack of proper accounting for high protein bioethanol co-products leads to erroneous results which lead to an ILUC penalty instead of an ILUC credit for these biofuel crops.

Modelling of oilseeds market

The GTAP model assumes that soy bean is grown primarily for the production of soy oil and that the use of soy oil for biodiesel production will be met by growing soybeans. However, it is widely accepted that soybean is primarily grown for the meal. Therefore contrary to the GTAP model, increased production of biodiesel from soy oil will lead to replacement of the soy oil on the global market by other vegetable oils and the production of other high protein biofuel co-products will reduce soybean expansion.

This is a fundamental error in the model, which affects the results for trade, land use change and ILUC factors. It gives an overestimation of the overall land used for the production of soy biodiesel and underestimates the land saved by soy meal replacement by other high protein biofuel co-products. These will both cause an overestimation of the GHG emissions from ILUC.

Change in trade flows

GTAP based models use Armington elasticity factors to determine the amount of increased biofuel crop demand, that will be provided by increased imports or reduced exports and how much will be grown in the region of biofuel demand. The applicability of Armington elasticites for this purpose is unclear and the results are opaque. The IFPRI model uses an arbitrary Armington elasticity factor of 10, which compares to an equally arbitrary vale of 2.6 used in the CARB version of the GTAP model. The proportion of increased demand of biofuel crop that will be provided by imports or reduced exports can be modelled directly by analysis of historic responses to crop demand changes. For changes in the demand for cereal crops in the EU, the Armington factor calculated from historic responses is zero.

The use of an arbitrary value for Armington elasticity factors, gives arbitrary results for changes in trade and hence land use change.

Type of land changes

In the IFPRI model, the determination of the amount of pasture and forest that will be displaced by extra cropland uses CET factors, which do not include unused and idle land in the EU and CIS. An arbitrary factor of

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50% is applied to carbon stock losses due to deforestation in the EU, to account for afforestation on idle land. However analysis of historic data shows that increases in demand for cropland in the EU will all be met by reduction in the rate of creation of idle land and only 12% of abandoned land in the EU is subsequently used for afforestation schemes.

Also it is estimated that 23M hectares of arable land has fallen idle since 1993 in the former CIS states and of this at least 13M hectares of unused farm land could be returned to production, with no major environmental cost.

The lack of inclusion of unused and idle land and arbitrary use of a 50% factor for afforestation will cause an overestimate of the GHG emissions from ILUC of biofuel crops grown in the EU.

Crop yield on land expansion

The IFPRI model uses of an elasticity factor to relate the yield on new land to existing yields. This has been set arbitrarily at 50% for the EU such that the yield on returned set-aside land is only 50% of current yields. There is no basis for this elasticity factor and it cannot be justified when area and yield growth estimates are based on analysis of historic regional data. The effect of introducing such a factor results in overestimating land area changes as a result of crop demand increases.

Fertiliser use for yield expansion

The IFPRI model assumes that increased yield is achieved primarily by increased fertiliser addition and calculates penalties for nitrogen fertiliser manufacture and emissions from land on this basis. There is no justification for this assumption. Increased yield in many regions is primarily achieved by use of better crop varieties, better crop husbandry and use of pesticides and fungicides, which have little impact on GHG emissions per unit crop output.

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