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Comment on
Assessing the Land Use Change Consequences of European Biofuel Policies
by David Laborde. IFPRI, 2011 (hereafter referred to as "the study")

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Preface

The following comments on the study are entirely on aspects related to animal feeds and feeding and do not have a broader coverage. To clarify matters, the comments refer mainly to summary statements provided in box 3 of the report (pages 72-73). If reference is made to other parts of the study, page numbers are provided in parentheses.

Thesis

According to the findings of the study, the performance of biodiesel and bioethanol in reducing greenhouse gas emissions is quite different. The reason for this is the different appraisal of the respective feedstuff as a co-product of the biodiesel and bioethanol production.

Comments

1. Starch

The study states that ethanol and biodiesel can be

"… produced with 'polyvalent' feedstocks that generate important coproducts, in particular for the livestock industries (meals and DDGS). However, the dynamics associated to the two types of biofuels are very different. For ethanol, the key issue is to extract 'energy', i.e. carbohydrate from starch, from cereals. This operation can be done by relying on existing production to some extent and the demand displacement will be more limited: the proteins are not removed from the livestock industry due to additional biofuel consumption." It is then summarized that the "direct effect of a new demand of ethanol has very different effects. It does not require additional production directly. It is just a matter of extracting the 'energy/sugar' from existing cereals used for feed. Of course, the carbohydrate should be replaced but it is a weaker constraint. The model predicts that only 56 percent of corn has to be additionally produced."

This statement as it stands cannot be accepted as it completely ignores that starch is the major energy source in diets of poultry and pigs in commercial diets worldwide (see Wiseman, 2007).

While ruminants can partially replace starch with cell-wall carbohydrates and maintain productivity, diets for grower and finisher pigs and lactating sows require that cereal grain inclusion level to be around 60 to 70%. Therefore, if starch in cereal grains is converted to ethanol instead of delivering energy to the animal, starch from cereal grains can either be replaced by other starch sources such as tapioca or a combination of starch sources and fat (oil). However, both sources would require additional agricultural production that will add carbon value to the ethanol production from cereal starch.

Moreover, starch can not be simply replaced by other carbohydrate sources, e. g. from plant cell-wall, which are less digestible than starch (e.g., Noblet and Perez, 1993), without strongly compromising the performance of the animals. This, in turn, would lower the overall energy and nutrient use efficiency of the respective production system. Therefore, the statement that the "situation is different for wheat and maize, however, where the direct replacement ratio is low, between 50-60 percent. In addition, these two crops are not replaced by other crops but are mainly taken away from the livestock sector and are largely replaced by their by-products maintaining protein supply at a reasonable level" (page 66) is not valid as it stands.

In either case, the alternative energy source to starch in cereal grains must be fully accounted for – also in terms of GHG emissions – if starch from wheat or maize (corn) is used for ethanol production.

2. Protein

The study states that when

"… additional cereals production take place to provide more inputs for the ethanol sector, the supplementary amount of DDGS will replace partially existing meals that may have high carbon values."

This is a very simplistic view that implies that a fair comparison of protein feeds such as DDGS and "existing meals" such as rapeseed meal or soybean meal can be made simply based on the basis of protein concentration, i.e. on an isonitrogenous basis. In other words, one unit of (crude) protein from DDGS would replace one unit of (crude) protein from an existing meal or, even more simplistic, one unit of DDGS would replace one unit of an existing meal.

This assumption is not realistic. A fair comparison would need to consider that the amino acid composition of different protein sources and the supply with digestible amino acids within the small intestine can be quite different. Maize-based DDGS in particular has an unfavourable amino acid pattern compared with requirements of poultry and pigs (e.g., Cromwell et al., 1993; review by Stein and Shurson, 2009) and thus, either more protein is needed to achieve the same yield in terms of animal products or amino acids must be supplemented and their carbon value also be accounted for.

Moreover, it can not be ignored that protein feeds do not only supply animals with amino acids but also energy. The superior quality of soybean meal for poultry and pigs is partly based on its high protein concentration and quality; and, particularly in pigs, partly on its high energy concentration (in terms of metabolizable energy; Baker and Stein, 2009). Therefore, the energetic value of protein feeds must also be considered when comparing DDGS to existing meals. In summary, no attempts were reported in the study to account for differences among protein feeds in terms of amino acid and energy supply to animals which introduce bias in the interpretation of data and conclusions.

3. Rapeseed

The study states that

"…As a matter of "fact" the model computes … that 78 percent of the additional consumption of rapeseed needed to produce the additional oil has to come for new production. As a side product, meals also save land by displacing other feedstuffs used by the livestock sector. However meat production also absorbs this additional production of meals since it will lower the price of proteins."

Although the first part of the statement can be accepted except the number of 78 percent for reasons indicated below, the last sentence is debatable. All published prospective studies claim that worldwide meat production will increase over the next decades in any possible scenario. If additional rapeseed meal can help to supply feed protein to satisfy the increasing demand, this would add an extra value also to the production of extra oil for biodiesel. In general, the versatile use of rapeseed meal as a protein feed in farm animal nutrition is not incorporated to any extent in the study. Based on an extensive literature review, Hippenstiel et al. (2012) recently concluded that "… rapeseed products for ruminants, such as rapeseed meal, compare well with soybean meal for dairy cows. Recent research on rapeseed meal has shown that it can fully replace soybean meal within dairy cow diets when fed on an approximately isonitrogenous and isocaloric basis, i.e. without considering differences in ruminal degradation or amino acid pattern, or both. Moreover, milk and milk component yields were similar for diets containing soybean meal or rapeseed meal." Similarly, the use of rapeseed meal in dairy cows diets in North America have successfully replaced soybean meal without loss of milk or milk component production (see Huhtanen et al., 2011).

Conclusion

In conclusion, a balanced comparison between different feedstocks for biofuel production can only be made if the feeding value of co-products is considered which has not been made in the study. This includes the energy content as well as the amino acid composition of the respective co-product. The study lacks this consideration; therefore its findings towards the different carbon values of biodiesel and bioethanol are seriously flawed.

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