HLPE Consultation on the V0 Draft of the Report: Biofuels and Food Security

GENERAL COMMENTS FROM THE UNITED STATES:

The "Biofuels and Food Security" Report ("the Report") addresses an important topic: the impact of transportation biofuels production and use on food security. The Report provides useful insights into the state of global agricultural markets and land use practices, as well as environmental and social implications. We wish to provide the HLPE with the following input.

The Report inadequately considers the work of the FAO Bioenergy and Food Security Project and the Global Bioenergy Partnership on bioenergy and food security. The CFS mandated: "the HLPE to conduct a science-based comparative literature analysis, taking into consideration the work produced by the FAO and Global Bioenergy Partnership (GBEP), of the positive and negative effects of biofuels on food security to be presented to the CFS." However, the report only briefly cites work of the FAO Bioenergy and Food Security team. The work of GBEP is mentioned in a trivial way and is inaccurately listed under the section on certification schemes. *The HLPE must restructure and rewrite this document in a manner that adequately takes into account the existing work of the FAO and GBEP on biofuels and food security.*

The quality and impact of the Report will significantly benefit from considering previously published research, which assesses: the economic, social and environmental feasibility of biofuels; the impacts global and national biofuels policies; and the full range of impact(s) of biofuels production on food and nutrition security. In addition, more in-depth analyses of the industry dynamics and the forces leading to changes in local and global commodity markets would help in assessing the potential impact of biofuels on food security. Currently, the Report is written as a policy discussion piece, premised on the bias that nationally determined biofuels mandates - such as those in Brazil, the U.S. and EU - are overwhelmingly responsible for driving up the prices of food and thereby decreasing food security for the global poor. The report draws on a biased and unrepresentative sample of academic and (non-peer-reviewed) NGO publications to convince the reader of this outcome. The authors would be better served by summarizing the macro- and micro-economic literature, as opposed to using simplistic aggregate calculations of the possible impact of bioenergy on global energy supplies and on food security.

Future drafts of this paper should reflect the conclusions of FAO BEFS and GBEP, specifically that: bioenergy can improve energy access and food security for smallholder farmers in developing countries, when implemented in a rational and sustainable manner. In section 4.2.4 the paper mentions a balanced approach to bioenergy, citing "[a] recent UNU-IAS study on Biofuels in Africa by Gasparatos et al (2010) [that] develops a useful typology of biofuels at the level of individual production systems, demonstrating the importance of going beyond aggregate considerations**."** The paper should be restructured to take into account the different roles that bioenergy and biofuels play in developed and developing countries, as well as the importance of looking seriously at distinct contexts when creating and implementing policies on the production and uses of bioenergy.

KEY PROBLEMS TO ADDRESS

1) **It is insufficient for the HLPE to merely consider globally aggregated impacts of transportation biofuel production and use on food security**. The HLPE must disaggregate the impacts of industrial transportation biofuels production from bioenergy for sustainable development. We recommend more rigorous calculations of the impact of biofuels that provide a thorough treatment and clearer evidence from available data, taking into account regional and national circumstances. Throughout the report, we also recommend using consistent, clear, and standardized definitions of food and nutrition security and bioenergy.

2) **The HLPE *must* provide a more nuanced and thorough account of the causes of food and nutrition insecurity in developing countries, which draws upon a broader selection of the literature**. Examples of causes include: post-harvest losses, due to a lack of energy access; insufficient infrastructure to transport domestically produced commodities and foods; national policies that inhibit development of the agricultural sector; and other limits on production, including barriers to trade. The HLPE should reference the work of FAO BEFS and the recent World Bank Report entitled "*Africa Can Help Feed Africa: Removing barriers to regional trade in food staples".* (See below for full bibliographic details.)

CONSOLIDATED REFERENCES TO INCLUDE

For the HLPE to be responsive to its mandate, the report should discuss and cite this work:

- Dale VH and KL Kline. 2013. Issues in using landscape indicators to assess land changes. Ecological Indicators. http://dx.doi.org/10.1016/j.ecolind.2012.10.007
- Djomo, S. N.; Ceulemans, R. 2012. A comparative analysis of the carbon intensity of biofuels caused by land use changes. *GCB Bioenergy* 4: 392-407.
- Efroymson RA, VH Dale, KL Kline, AC McBride, JM Bielicki, RL Smith, ES Parish, PE Schweizer, DM Shaw. 2013. Environmental indicators of biofuel sustainability: What about context? *Environmental Management 51(2)* DOI 10.1007/s00267-012-9907-5.
- FAO. 2010. *Bioenergy and Food Security: the BEFS analysis for Tanzania*, by Maltsoglou, I. and Khwaja, Y., Environment and Natural Resources Working Paper No. 35, Rome.
- FAO. 2010. *Bioenergy and Food Security: the BEFS analysis for Peru, Supporting the policy machinery in Peru*, by Khwaja, Y., Environment and Natural Resources Working Paper No. 40, Rome.
- FAO. 2010. *Bioenergy and Food Security: the BEFS analysis for Thailand*, by Salvatore, M. and Damen, B., Environment and Natural Resources Working Paper No. 42, Rome.
- FAO 2010a. SOFI Technical Notes (methodology). The State of Food Insecurity in the World 2010 Technical notes. http://www.fao.org/publications/sofi/en/
- FAO 2010b. Food Outlook. Nov 2010. http://www.fao.org/giews/english/gfpm/index.htm
- FAO 2009a. Hunger in the Face of Crisis: Global Economic Slowdown Underscores Urgency of Addressing Long-Term Challenges. http://www.fao.org/economic/es-policybriefs/briefs-detail/en/?no_cache=1&uid=35540 Economic and Social Perspectives, Policy Brief #6. September 2009. This and other policy briefs at http://www.fao.org/economic/es-policybriefs

- FAO. 2009b. The State of Food Insecurity in the World. http://www.fao.org/publications/sofi
- FAO-IIASA (2007). "Mapping biophysical factors that influence agricultural production and rural vulnerability." Food and Agriculture Organization and International Institute for Applied Systems Analysis, Rome 2007.
- Fisher, M. J., I. M. Rao, M. A. Ayarza, C. E. Lascano, J. I. Sanz, R. J. Thomas, and R R. Vera 1994. Carbon storage by introduced deep-rooted grasses in the South-American savannas. Nature 371:236-238.
- Global Bioenergy Partnership. 2011. *The Global Bioenergy Partnership Sustainability Indicators for Bioenergy, First Edition*, Rome.
- Heaton E., Voigt T., Long S.P., A quantitative review comparing the yields of two candidate C4 perennial biomass crops in relation to nitrogen, temperature and water. Biomass and Bioenergy 27:21-30 (2004)
- Heaton E.A., Dhleman F.G. and Long S.P., Meeting US biofuel goals with less land: the potential of Miscanthus. Global Change Biology 14: 2000-2014 (2008)
- Kim, Hyungtae, Seungdo Kim, and Bruce E. Dale. "Biofuels, land use change, and greenhouse gas emissions: some unexplored variables." *Environmental Science & Technology* 43, no. 3 (2009): 961-967.
- Kline KL, VH Dale, R Lee, and P. Leiby. 2009. In Defense of Biofuels, Done Right. *Issues in Science and Technology* 25(3): 75-84
- Kwon, H.; Wander, M.; Mueller, S.; Dunn, J. B. 2013. Modeling state-level soil carbon emission factors under various scenarios for direct land use change associated with United States biofuel feedstock production. *Biomass and Bioenergy*, under review.
- Mann, L., and V. Tolbert. 2000. Soil sustainability in renewable biomass plantings. Ambio 29:492-498.
- Mueller, S.; Dunn, J. B.; Wang, M. 2012. Carbon Change Calculator for Land Use Change from Biofuels Production (CCLUB) Users' Manual and Technical Documentation. ANL/ESD/12-5. May 2012.
- Mueller, S.; Copenhaver, K.; Begert, D. 2012. An assessment of available lands for biofuels production in the United States using United States Department of Agriculture (USDA) cropland data layers. *Journal of Agricultural Extension and Rural Development*, 4: 465-470.
- National Research Council. 2012. Sustainable Development of Algal Biofuels in the United States. National Academies Press, Washington, D.C.
- National Research Council. 2011. Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy. National Academy Press, Washington, D.C.
- Oladosu, Gbadebo, Keith Kline, Rocio Uria-Martinez, and Laurence Eaton. "Sources of corn for ethanol production in the United States: a decomposition analysis of the empirical data." *Biofuels, Bioproducts and Biorefining* 5, no. 6 (2011): 640-653.
- Oladosu, Gbadebo, Keith Kline, Paul Leiby, Rocio Uria-Martinez, Maggie Davis, Mark Downing, and Laurence Eaton. "Global economic effects of US biofuel policy and the potential contribution from advanced biofuels." Biofuels 3, no. 6 (2012): 703-723.
- Oxfam 2010. Hunger in the Sahel: A permanent emergency? Oxfam Briefing Note (Etienne du Vachat; Eric Hazard) 15 December 2010.

- http://www.oxfam.org.uk/resources/policy/conflict_disasters/downloads/bn-hunger-in-the-sahel-15122010-en.pdf Accessed January 24, 2011.
- Parish ES, KL Kline, VH Dale, RA Efroymson, AC McBride, T Johnson, MR Hilliard, JM Bielicki. 2013. A multi-scale comparison of environmental effects from gasoline and ethanol production. *Environmental Management* 51(2) DOI: 10.1007/s00267-012-9983-6
- Pate, R., G. Klise, and B. Wu. 2011. Resource demand implications for U.S. algae biofuels production scale-up. Applied Energy 88(10):3377-3388.
- Tolbert, V. R., D. E. Todd Jr., L. K. Mann, C. M. Jawdy, D. A. Mays, R. Malik, W. Bandaranayake, A. Houston, D. Tyler, and D. E. Pettry. 2002. Changes in soil quality and below-ground carbon storage with conversion of traditional agricultural crop lands to bioenergy crop production. Environmental Pollution 116: S97-S106.
- Wallington, T. J.; Anderson, J. E.; Mueller, S. A.; Kolinski Morris, E.; Winkler, S. L.; Ginder, J. M.; Nielsen, O. J. 2012. Corn ethanol production, food exports, and indirect land use change. *Environmental Science and Technology*, 46: 6379 – 6384.
- M. Wang, J. Han, J. Dunn, H. Cai, and A. Elgowainy, 2012, "Well-to-Wheels Energy Use and Greenhouse Gas Emissions of Ethanol from Corn, Sugarcane, Corn Stover, Switchgrass, and Miscanthus," Environmental Research Letter, 7 (2012) 045905 (13pp).
- Wang, M., J. Han, Z. Haq, W. Tyner, M. Wu, and A. Elgowainy, 2011, "Energy and Greenhouse Gas Emission Effects of Corn and Cellulosic Ethanol with Technology Improvements and Land Use Changes," *Biomass and Bioenergy* 35 (2011): 1885-1896.
- World Bank. 2012. *Africa Can Help Feed Africa: Removing barriers to regional trade in food staples,* Poverty Reduction and Economic Management - Africa, Washington, DC.

Together, these publications make the following essential points when considering the relationship between bioenergy and food security. Specifically:

1) The positive or negative impacts of bioenergy on food security raise complex issues, which need to be considered in country-specific, regional, and international contexts.

2) The production and uses of bioenergy have benefits and challenges. Policy tools - such as the BEFS Analytical Framework and the GBEP indicators - can assist countries in optimizing the benefits and minimizing the challenges, including challenges to food security.

3) Food insecurity is driven in large part by a lack of energy access. Bioenergy production and use can improve food security by providing energy for food production, food storage (drying and cold storage), and food transportation.

ITEMIZED COMMENTS

“Executive Summary” Section

The objective of the Report, as stated in the following paragraph, is only partially met. The report states that *“The central concern of this report is to analyze the implications for food security of global and national biofuels markets, as they were put in place in the first decade of the current millennium, through an evaluation both at the aggregate level of macro data and through field research carried out in different regions and localities.”*

Several assertions are not fully explained, leaving the reader with questions, For example:

1. *“Third generation biofuels are associated with algae production which while relieving land and food crop pressures are not themselves immune to environmental consequences and potential threats to food security.”* On page 32, the conclusion on the discussion on biofuels from algae reads: “*Second generation algae biofuels are therefore unlikely to be other than an exceptional option for developing countries (FAO, 2010; Subhadra & Grinson-George, 2010).”* Also, throughout the Report, there are references to algae as “second” but also as “third” generation biofuels.

2. *“There is significant evidence that a substantial fraction of each ton of crops diverted to biofuels comes out of consumption by the poor, and that could greatly exacerbate malnutrition if biofuels grow to 10% of the world’s transportation fuel.”* No direct reference to this statement is found anywhere else in the Report, and no citations support this statement. In fact, the report reads as if this is the foregone conclusion and selected references are found that can support this conclusion without actually doing a full comparative review of the literature. Concerns about global shortages of productive ag/forest land ignore regional differences and market dynamics. Resource Planning Act projections for the US show that increases in bioenergy demand reduce conversion to urban use and result in more productive land area to meet future needs. *Source*: USDA Forest Service 2012. Future of America's Forests and Rangelands: Forest Service 2010 Resources Planning Act Assessment. GTR WO-87. Washington DC. 198p.

3. The executive summary overstates the concern about soil depletion from bioenergy production. U.S. studies of whole tree harvest have shown that the practical management limits of biomass collection often are sufficient to maintain soil productivity, and relatively simple/modest retention requirements are sufficient for most other ecosystems. While exceptions do exist, these exceptions should not disqualify investment in any additional biomass production. Please see Farve, R. and Napper C. 2009 Biomass Fuels and Whole Tree Harvesting Impacts on Soil Productivity - Review of Literature. USDA Forest Service National Technology Development Program, San Dimas CA 60p. Waring R.H. and Running S.W. 2007. Forest Ecosystems: Analysis at multiple scales, 3rd Edition. Elsevier Academic Press. San Diego CA. 420p.

4. The concern about increased land investments in Africa cannot be solely attributed to biofuels. Africa has experienced substantial improvements in governance, resolution of previous armed conflicts, democracy and rule of law over the past 2 centuries. Increased investment in such new markets is expected, regardless of any bioenergy demand. In addition, these investments are portrayed as negative, ignoring the substantial benefits to the African nations accrued by such investments.

- The executive summary does not address the purpose of the report until 5th paragraph, and the opening paragraph presents a hypothetical calculation of how much fuel can be produced from the world's crop production. It seems inappropriate to open the report with such a hypothetical calculation based on policies not necessarily being considered.

- It is always useful to measure current developments by historical phenomena. This is not the first time a major new use of food crops has diverted grain away from human consumption. There were relatively few feed yards in existence before the 1950s. Massive amounts of corn and other grains now go to finish cattle in feed yards and this has not really affected the amount of grain available for human consumption. It would be very difficult to attribute price increases with certainty to the change in use. It would have served the authors well to have examined supply and demand during that period.

- Page 3, 3rd paragraph, reference to "fuel crops" should be "food crops"?

- Page 2, last paragraph, seems to suggest that "flexible agricultural products" may be undesirable, but there is no definitive analysis on this topic yet. Moreover, the overall view is that flexibility in the use of different crops has positive effects on farmers, since it gives them a better say in determining crop prices.

- Page 3, 3rd paragraph, mentions "significant evidence" of diversion of crops to biofuels that comes out of consumption by the poor. This is unproven in the literature, and the evidence from the world's largest biofuel producer, the United States, contradicts it (Oladosu et al, 2011).

- Page 3, 4th & 5th paragraph presents the main argument of the paper, but as will be shown below these arguments is unsupported in the literature and the empirical data.

- Page 4, paragraph 5, highlights the negative effects of biofuels and mentions potential positive effects on food security through new sources of income and employment, and as alternative sources of energy for rural and urban communities. However, this paragraph fails to mention the main benefit and original motivation for biofuels, which is to replace fossil fuels. Although, this is related to biofuels use as an alternative source of energy, the real benefit of biofuels is in helping to relieve the tightness of the oil market. The report alludes to this potential in many places, particularly in the next section which discussed biofuel policies around the world with the objective of "replacing" a percentage of oil-based fuels. This is a particular omission in the report and in much of the literature (Oladosu et al, 2012).

- p. 1 – The calculation with 10% of global transportation fuels with biofuels is hypothetical. Even where this statement appears in the report (page 8), it seems out of place. Furthermore, the assumption of this calculation is no change in crops, production, efficiency, yields, etc. (as stated in footnote 15 of the report); yet changes and improvements in feedstock modes, management and productivity are ongoing.

- p. 1 of the Executive Summary, first para. - It is unclear why the report begins by considering the "totality of the world´s crops to produce biofuels." No one is suggesting this alternative, nor is anyone considering that that all energy be supplied from any one source.

- p. 1 of the Executive Summary, first para. If 85% of the world's fresh water resources are mobilized, is this volume of water completely unrecoverable and unavailable for reuse? The meaning of "mobilized" is unclear.

- p.1 of the Executive Summary, 3rd para. The first sentence is a political statement, which does not belong to the report.

- p. 2 of the Executive Summary, last para. The authors appear to be arguing against the concept of biorefineries, which can offer opportunities in maximizing the conversion of carbon in the feedstock. Also, non-fuel compounds that are produced could offset conventional products which would have economic, land use, greenhouse gas emissions, and other implications. The authors need to provide a clearer explanation of their case against biorefineries and lay out definitions for primary and secondary processing.

- p. 4 of the Executive Summary, 3rd full para. Throughout the report, different units of energy are used for overly simplistic quantification of the total energy content of biofuels. In this paragraph, "raw chemical energy" and "primary energy" are used in the same sentence with both energy quantities being undefined and unclear. What does the world's total primary energy include in the authors' estimation? In this same paragraph, solar energy is also considered. Is this value included in the primary energy estimate of the authors? In footnote 18 on p. 41 the authors provide an explanation of how the energy content of biofuels is calculated, but not how the primary energy is calculated. This mixing and matching of undefined energy quantities is confusing at best and misleading at worst. As stated above, the authors should rely on the peer-reviewed literature, not back-of-the-envelope calculations to assess the energy burdens and benefits of biofuels.

- Page 4 – It is good to see that the report talks about both the positive and negative effects that biofuels production can have on food security. Additional positive effects that are not mentioned include increases in the intensity of crop production, and use of crop residues allowing for improved production in high-yield situations. Causes of food price volatility include concentrated supply sources, persistent low-priced food commodities, food aid, and speculation. Food and nutrition security are critical issues that are not going away any time soon. Some steps that could address the problem of food insecurity include (Oxfam 2010; FAO 2009 a and b, FAO 2010 a and b)

1. Improving rural livelihoods *
   - ✓ Agriculture
   - ✓ Market access
   - ✓ Timely information
2. Reducing risk
   - ✓ Social safety net
   - ✓ Transform food aid
   - ✓ Economic resilience
     - Diversify markets *
     - Expand bases of production *
3. Improving analysis and monitoring (e.g., to provide early warning of areas of concern)
4. Improving institutional capacity, policies, market functions
5. Reducing volatility*

- The items starred above are where biofuels could provide some help. Yet this report claims that "any biofuel growth would exacerbate that challenge" of addressing food security's need to produce more food (p. 4).

- P. 4 – The report fails to note that the relationship between biofuels and food security is most affected by current patterns in distribution of food.

- P. 4 - The authors claim that biofuel growth projected to 2050 "would consume 85% of the world's freshwater diverted from rivers and aquifers" with no support for the statement. In any case, they must not be referring to "consumed water" but rather "utilized" water.

- P. 4 – It is true that "current initiatives to ensure responsible land investments are inadequate and measures are needed urgently to defend the rights of those traditional communities occupying and using these lands." However putting the blame for these problems on biofuels is incorrect. In fact, fossil fuel expansion is responsible for much of the direct land-use changes (Parish et al. 2013). It would be more productive to address land tenure issues directly than thru biofuels policies.

-
- P. 5 – It is not clear what is meant in the report by saying that the relationship between food insecurity and biofuels in the US "is expressed in the conflict which pits the food industry against the proponents of biofuels using food crops." Our observation is that this supposed conflict is an interpretation of the popular press for which there is little empirical evidence.

- P. 5 – It is unclear why the drought impacts on US corn production in 2012 are touted as being associated with biofuels. Indeed, the prior expansion of corn production due to biofuels may have reduced the effects of the drought (1) by lessening the ongoing cropland decline and (2) by increasing the intensity of corn cultivation.

- P. 5 – Why is the surge in alternative fossil fuels mentioned? It could be discussed as to its effect on increased food production, for much of the cost of agriculture (and the largest recent increase) is due to fossil fuel use.

- P. 5 - It is unclear what is meant by "changes in the rules of the game."

- P. 5 – There is great uncertainty about the amount of previously cleared and underutilized land that is available for agricultural expansion without deforestation. Estimate range from 500 to 5000 M ha globally [Kline et al. (2009) based on FAO/IIASA (2007) and on page 39 this FAO/IASSA report and its uncertainties are finally mentioned]. Yet this report claims "high-end estimates of up to 445 M ha include areas currently covered by dense forests or by savannas" and fails to provide a source for that number nor to mention the uncertainties in the estimate.

- p. 5. The authors state that the food implications of algae would be limited to fisher communities. It is unclear whether the authors are referring to the production of algae that can grow in salt water. The current thinking in the algae R&D community is that in the case of salt water growth, algae will be growth in coastal, marginal areas and in the case of fresh water growth, algae will be grown in marginal areas where fish farms are not established.

“Draft Policy Recommendations” Section

Policy recommendations. The authors’ draft policy recommendations indicate that “we must advance beyond a discussion of mandates and subsidies to include mechanisms for controlling the growth of biofuel markets,” and those policies “should now be directed at ensuring that domestic ceilings are not made innocuous by the emergence of a global biofuels market.” What exactly does that mean given the predominant use of ethanol as an oxygenate for U.S. gasoline? Do the authors intend to suggest mechanisms for controlling the growth of U.S. gasoline consumption? Do the authors intend to discourage international trade of ethanol for use as a gasoline oxygenate? Can the authors suggest what chemical should be used in place of ethanol as a gasoline oxygenate, or do they believe that gasoline should no longer contain an added oxygenate, even at the expense of cleaner air? All of these questions are relevant to concerns about the connection between biofuel production and food prices.

In the discussion on certification schemes (also discussed in Section 5.3), the authors recommend that “only certification schemes which are multi-stakeholder, fully participative, and transparent be recognized”. In addition, they cite only a single study (as opposed to the expected numerous academic studies) in Section 5.3 that suggests that certification schemes are difficult to enforce and, as farm-level measures, do not account for the context in which production decisions are made. Does this imply that the Report authors are reconsidering their enthusiasm for certification schemes.

Section 1 Comments: BIOFUELS POLICIES

General comments:

Sections of the draft require much more evidence from the available literature. The two-paragraph section on biofuels in Latin America (1.4.6) is short and worth keeping, but it references a figure that could not be located. The authors could consider expanding this section. The Latin America-specific information in Appendix I was useful.

Methyl tertiary butyl ether (MTBE). The report lacks a clear and consistent assessment of the switch from MTBE to ethanol as an oxygenate in U.S. gasoline and its impact on U.S. biofuel demand. The switch done in the name of improving human health is the primary policy driver that led to the higher levels of ethanol consumption that we observe today. The authors need to explain the environmental considerations that motivated the switch away from MTBE and distinguish these concerns from the political and economic motives behind other policy incentives to biofuel production. At the beginning of Section 1, the authors mention the MTBE ban but provide no context regarding concerns about MTBE and drinking water supplies. At the bottom of Section 1.1, the authors state that Babcock (2011) found that given continuing high oil prices, U.S. ethanol production could survive without mandates, but do not mention the MTBE ban. Later, in Appendix III, however, the authors mention that Babcock in fact was describing a counterfactual situation with high oil prices, an MTBE ban, and no mandates. The fourth paragraph of Section 1.1 blurs the timeline regarding MTBE.

China. The report's portrayal of biofuel in China is basically correct. China started up a small grain-based ethanol program around 2002-04, but capped grain use (about 3-4 mmt annually) for ethanol and rolled back subsidies for manufacturing grain-based ethanol due to food security concerns. Biodiesel is a non-starter in China, due to its huge deficit in edible oils. Non-grain biofuels experiments have produced no apparent commercial success so far.

China may have a large non-grain biofuel project planned or underway on the coast of Zhejiang Province. The planned feedstock is vague, but appears to rely on cassava for the foreseeable future. A sweet sorghum biofuel project does not appear to have gone past the experimental stage.

Around 2008-09 American government teams (USDA ERS) visited ethanol plants in Jilin and Anhui Provinces and the sweet sorghum, jatropha and cassava-based projects. In 2009, the USDA Economic Research Service published a report, *China Is Using More Corn for Industrial Products*, which summarized the lessons learned on these visits.

Specific comments:

- ***Section 1.1:*** In the case of Brazil, the assertion *"Biofuels (in Brazil and the US) were not the result of policies to regulate a market…"* is not accurate. Production and use of sugarcane-based fuel ethanol in Brazil began in 1975, when the Alcohol Program (*Proálcool*) was launched in response to soaring oil prices and a crisis (low prices) in the international sugar market. The program resulted in new commercial uses for sugarcane and made Brazil a pioneer in the use of ethanol as a motor vehicle fuel. Brazil's development in this area was facilitated by the country's availability of feedstock, a supportive ethanol policy environment, and efficiency improvements in cane production and ethanol conversion processes. Until 1999, the country's supply of feedstock was stimulated by decades of Government support provided through controls over producer prices for sugarcane: the Government set prices along the sugarcane and sugarcane products chain, established production and marketing quotas for both sugar and ethanol, and was the only domestic distributor and exporter of sugar and ethanol (OECD, 2005).

- Also the statement *"After a decade Brazil was producing 12 billion liters a year and, in addition to a blending demand of some 20% with gasoline…"* is not correct. By 1977 (two years after the Brazilian Biofuels program had been initiated) the blending rate in various regions of Brazil had already reached 20 percent.

- In this same section (paragraph 4) ethanol policy in Brazil responds to developments in the sugar market, more so than to changes in the oil price, as indicated in the Report. In Brazil, the increase in international sugar prices in the early 1990s resulted in a larger share of Brazil's sugarcane being used for domestic sugar production, leaving less for ethanol production. These factors led to severe ethanol shortages by the late 1980s and early 1990s and decreased demand for Brazilian ethanol-fueled vehicles.

- ***Section 1.3:*** The discussion on the new dynamics lacks the stark difference in Brazil's development of its ethanol *versus* biodiesel industry and the heavy involvement of the Government in the marketing (auctions) of biodiesel.

- ***Section 1.4.6:*** The statement: *"The development of biofuels policies in Latin America were very much influenced by Brazil, particularly in Central America which was seen as a potential platform for exporting to the US without having to pay the 54 cents tariff…"* is misleading, as the region had its own sugarcane-based ethanol industry years prior to the 2002-09 Brazilian exports of hydrous ethanol to the Central American and Caribbean countries of Costa Rica, El Salvador, Jamaica, and Trinidad and Tobago, which was re-exported to the United States as anhydrous ethanol under the duty-free Caribbean Basin Initiative (CBI).

- p. 7, It does not appear that Figure 1 is discussed in the paper (pg.7).

- p. 12, statements regarding China's use of cassava are basically accurate in the point they are making, but the trade numbers overstate the impact of biofuel.

- "*Thailand, the largest cassava exporter in the world, sent nearly 98 % of its cassava production to China to make biofuel in 2010*."
  Thailand does not export 98% of its cassava production to China. In 2010, China took 98% of Thai exports of cassava in its chopped or pelletized form. Large starch industries in Thailand; large Thai feedmills; and several Thai ethanol plants use substantial amounts of cassava that are not exported. China began to dominate Thai raw cassava exports in 2001; 2008 was a relatively low year for these exports, when EU feed usage outbid China ethanol

usage. A new Thai ethanol plant is dedicated to exports to China, shipping ethanol from cassava rather than cassava itself.

- Suggestion: "Raw cassava exports from Thailand, the world's largest exporter, switched from shipment to the EU for feed use to shipment to China for biofuel after 2001. In 2010, Thailand sent 98% of its raw cassava exports to China." (source: Thailand Biofuels Report, 2012, FAS/USDA. http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Bangkok_Thailand_6-29-2012.pdf)

- China has one ethanol plant in Guangxi Province using cassava as a feedstock. It is true that domestic supplies of cassava were not adequate to support the plant's projected biofuel output and cassava has been imported from Thailand (and 30% from Vietnam). China's imports of cassava have indeed surged, exceeding 6.5 million metric tons during the first 11 months of 2012. However, careful analysis of customs statistics indicates that only a small portion of the cassava was imported in the region where the cassava-based ethanol plant is located (Nanning, Guangxi Province). The primary destinations for cassava were in the northern half of the country (Qingdao and Nanjing) where the cassava was presumably used for starch and feed industries. These regions have a history of importing cassava that precedes the non-grain biofuel production campaign. "*Cassava exports to China from Thailand has increased fourfold since 2008 (Rosenthal, 2011; Sidhu, 2011)*." This overstates the increase because 2008 was an unusually low year for cassava imports. China's cassava imports were about 4-5 mmt during 2006-07, fell to 2 mmt in 2008, and have been 5-6 mmt since then. The increase has been large (1-2 mmt) but not fourfold.

- Page 6, paragraph 2, contains some statements about Brazil that seem to lump more recent developments on new car sales with the production of 12 billion liters "After a decade" – by the 1980s. Similarly, in the next paragraph the ban on MTBE in the 2000s needs to be dated and placed after all the other policies that were already in existence.

- Page 8, section 1.4: The last statement of the opening paragraph is presented without context, since we have no information on the blending percentage for each country. The calculation also does not say whether this applies only to the 50 countries mentioned in this paragraph, although it mention in the opening paragraph of the executive summary suggests otherwise.

- The section on country-based typologies is too brief and does not establish its particular role in the report. This is important since these typologies could be useful, but also misleading when applied improperly. For example, a typology of countries may help correct the mistaken belief that there are "marginal lands," which could support Jatropha for biofuels in China, India, and other places.

- P. 9 – Referring to a "clean and green fuel" seems to be an oxymoron; all fuels are dirty and none are entirely green.

- P. 10 – FDI is not defined

Section 2 Comments: BIOFUELS AND THE TECHNOLOGY FRONTIER

General comments:

The report contains several unusual and contradictory statements about developing countries. First, in their recommendations, the authors seem enthusiastic about biomass in the "hinterlands of developing countries." If this is the case, why do the authors subsequently claim that the "skill, scale, and logistics necessary for second generation biofuels would make [biofuels] inappropriate for most developing countries today"? If such technologies are available and commercially viable for the developed countries, then why would they be inappropriate for most developed countries? Section 2.4, which addresses these unusual recommendations, contains not a single citation. For a comparative literature review, the absence of citations is unacceptable.

Specific comments:

- p. 18, Why is soy based biodiesel not included in Tables 1 and 2?

- Section 2.2: There is no reference for the statement that "The IEA, together with a range of other research, now considers that second generation biofuels will not be commercially viable before 2020".

- Also there needs to include more references on the statement about ILUC than the Searchinger (2008) study.

- Section 2.4: The last statement of the first paragraph suggests that second generation biofuels will displace food crops and produce ILUC effects, which is a preemptive statement, since it was acknowledged later in the paper that these have not been analyzed. Moreover, the paragraph recommends a new strategy for bioenergy in the context of contribution to development, but does not presents the pros and cons of this new approach. Why would this new strategy avoid displacing food crops in developing countries as suggested for second generation biofuels?

- P. 16 – The terms first generation and second generation biofuels are defined twice in the report. The definitions differ and are not entirely consistent (e.g., with regards to Jatropha).

- p.17 and 18, Fig. 2 and Table 2. Simply putting results from different studies is problematic. Some harmonization is required in order to make studies and their results somewhat comparable. Otherwise, it could be apples and oranges together. Efforts have been done (e.g., the NREL study on harmonized biofuel GHG reductions), and those results should be considered. Also, newer biofuel GHG results are documented in two recent journal articles by Argonne National Laboratory (Wang et al. 2011 and Wang et al. 2012). Also, LUC results for cellulosic biomass for biofuel production are in a forthcoming journal article (Kwon et al. 2013).

- P. 18 – “appropriateness” is never defined. [Similarly, the report never defines “sustainability.”]

- P. 19 – The authors do not seem to recognize that the only way that biofuels will succeed is via the use of different crops, production modes, logistics, fuels, etc. There is no “one size fits all” approach that will succeed. There have been some failures, but those situations do not mean that other forms of bioenergy enterprises will fail.

- P. 20 – The report comments on biofuels from algae displacing coastal marshlands but there are many places where algae could be produced for biofuels.

- P. 20 – Just like many of the models using to document iLUC, the report assumes that second generation crops will have iLUC effects because of their “general dispersion and the tendency to occupy more grassland.” The meaning of the first point is unclear and the second point is far from universal. But even if they held, it is not clear why they imply iLUC effects are occurring.

Section 3 Comments: BIOFUELS, FOOD PRICES, HUNGER & POVERTY

General comments:

Section 3 of this paper considers biofuels, food prices, hunger, and poverty. First, the writing and reasoning throughout the section needs to improved. Second, the focus of this section is the impact of higher prices (due to crops being allocated to biofuels) on poverty and food insecurity. This premise alone may be questioned, as liiterature suggests that price transmission is low in food-insecure countries. One reason for this is that in most of the countries being discussed, 80-90 percent of food supplies come from domestic production. Therefore, prices are responding more to fluctuations in domestic production rather than world markets. Moreover, most of the imported foods are for the populations in urban areas who are often higher-income consumers and therefore not among the food-insecure populations within these countries.

Much of the discussion in the section revolved around the assumption that a third of the corn or wheat production of these countries would be allocated for biofuels; as a result, prices would rise, thereby resulting in lower consumption and a more precarious food security position. This assumption is also flawed. While that might be the goal of some of the major producers and/or developed countries, it is not for countries that are considered food-insecure.

The logical flow of Chapter 3 is as follows:

- The rising production of biofuels has increased the demand for crops.
- This has pushed up the prices for food commodities.
- This has increased the cost of food
- This causes the word's poor to spend an increasing share of their limited income on food (or buy less food which contributes to malnutrition among the poor).
- This reduces their ability to buy other necessities
- This increases poverty.

Conceptually, this set of relationships is valid. However, the paper lacks balance in how these relationships are interpreted and presented. The following premises of the paper are open to question:

Biofuels has been the dominant factor

The paper frequently states that increasing demand for biofuels has been the "dominant" factor pushing up food prices. "Dominant" is neither defined nor quantified, seems to be assumed by faulty logic, and in some places appears to be concluded before other possibilities are considered. A number of useful articles providing a broad context for addressing this topic are not discussed. For example:

- Hochman, G, D. Rajagopal, G. Timilsina, and D. Zilberman, "The Role of Inventory Adjustments in Quantifying Factors Causing Food Price Inflation." World Bank Policy Research Working Paper 7544, August 2011.

- Zilberman, D., G. Hochman, D. Rajagopal, S. Sexton and G. Timilsina, ""The Impact of Biofuel on Commodity Food Prices: Assessment of Findings", *AJAE* 95(2): 275-281.

- Beckman, J., Hertel, T., Taheripour, F. and W. Tyner. 2012. "Structural Change in the Biofuel Era." European Review of Agricultural Economics 39(1): 137-156. (Illustrates how different biofuel policies affect the transmission of energy price volatility to commodity price volatility.)

By "dominant," do the authors mean that biofuels have had a larger impact than any other individual factor, or than biofuels have had a larger impact than all the other factors combined? The paper acknowledges that many factors contributed to the increase in food commodity prices, including price of crude oil, biofuels subsidies, exchange rates, Chinese corn and soybean imports, costs of agricultural production, (and economic growth is alluded to in 3.2.1, second paragraph). Yet the authors ignore the impact of rapidly increasing global per capita meat production's impact on feed demand (separate from increasing commercialization of meat production which further increases the demand for energy and protein feeds), the world's increasing per capita food consumption of vegetable oils, and a two-decade downward trend in the growth rate in crop yields, which is, in part, attributable to a significant long-term reduction in global research and development.

In their logic, they assume that all these other factors have already taken place and that the marginal impact of biofuels is what caused the higher prices. Alternatively, it could be assumed that the upward trend in global biofuels production was already in place and that, at the margin, the impact of the other factors is what caused the increase in food commodity prices.

In section 3.3, the paper concludes that biofuels "has played the largest role in price increases" before even considering the role of exchange rates and Chinese imports of crops, which is subsequently covered in the next two sections. Some studies have concluded that the declining value of the U.S. dollar was the "dominant" factor contributing to the increase in world food commodity prices. These studies do acknowledge that, in many countries, local currency prices for food were much less affected. The paper being reviewed also discusses this local effect – but seems to confuse its conclusions based on "aggregate, global" impacts with its statements about local impacts.

In another place it states that crop prices rise when stocks and stock-to-use ratios are low, ignoring that stocks were lowest (and prices highest) after several years of widespread adverse weather conditions that reduced world crop production. Then, in 3.4.3, plummeting crop prices are attributed to bumper crops and increasing stocks. Aside from this, the impact of the supply side on prices is not substantively dealt with.

<u>Focus on U.S. Corn Based Ethanol</u>:

The paper focuses on U.S. corn-based ethanol, rather than the global biofuels picture. In doing so, it generally leaves the impression that it is U.S. corn and U.S. policy that are most symptomatic of the problem, rather than global grains, vegetable oils, and sugar used as biofuels feedstocks. The paper addresses the role of vegetable oils and sugar only once (3.2.2), and the role of the EU and Brazil is only alluded to. (It does not consider the important role of Argentine biodiesel production at all.)

Further, the focus is disproportionately on liquid biofuels for transportation. Some discussion on bio-electricity would be appropriate, as combustion of cellulosic biomass provides a relatively efficient use of biomass energy.

High food price levels vs. food price volatility

High prices and volatility of prices are treated together in one short paragraph (3.2). It is inappropriate to do so, because the factors contributing to each are quite different.

The paper alleges that biofuels have been the dominant factor contributing to higher food prices, with a particular focus on U.S. corn used as a biofuel feedstock. If so, then how do the authors explain the fact that prices for wheat and soybeans have risen more than the price of corn? And that the price of rice, which is not used as a feedstock, has risen more than any other food commodity. These price movements are inconsistent with the author's allegation that biofuels have been the dominant factor in raising food prices.

Global price increases are generally not well transmitted to many food insecure countries where local production accounts for the bulk of consumption. This was a finding in the ERS report "International Food Security Assessment, 2010 Update: Improved Production Mitigated Impact of Higher Food Commodity Prices" by Stacey Rosen, Shahla Shapouri, and May Peters, Outlook No. (GFA-21-01) 13 pp, May 2011. This point is made as well in a new IFPRI report--"Food Price Volatility in Africa: Has it Really Increased?" IFPRI Discussion Paper 01239, Nicholas Minot, International Food Policy Research Institute, December 2012.

The weak link between biofuels and local prices is acknowledged by the authors of the paper themselves on page 33, where they indicate that studies find little impact on wholesale prices. Their suggestion to look instead at retail prices is inappropriate, since biofuel production will not affect the margin between wholesale and retail prices.

Where higher prices, whatever the cause, were transmitted—for example higher wheat prices in Afghanistan—the impact was primarily felt in a decrease in dietary diversity among higher income groups. See the ERS report "Wheat Flour Price Shocks and Household Food Security in Afghanistan", by Anna D'Souza, Economic Research Report No. (ERR-121) 35 pp, July 2011.

Specific comments:

Section 3.5: The statement: "If biofuels rise to provide 10% of world transportation fuel in 2020 – which is consistent with many current world policies -- they will consume the equivalent of 26% of all 2010 crop energy." This calculation, according to the Report, *"assumes the present mix of biofuels continues, which rely heavily on maize and sugarcane. However, because we measure this percentage in energy terms – and it takes very roughly the same quantity of crop energy to make each exajoule of biofuel – the mix of crops would not greatly vary this percentage."* Earlier in the Report (and in other literature findings) it had been established that the energy yield ratio of sugarcane-based ethanol is 4 to 5 times greater than the energy yield ratioof corn-based ethanol. The assertion that the mix of crops would not vary these percentages it at odds with the authors' previous assumptions.

In this section, the statement*: "…that also implies that crop prices will reflect speculative judgments not merely about crop conditions but also oil prices"* lacks any discussion on returns across the commodities. For example, did returns to soybeans, pasture, forest products fall less than returns to sugarcane? What factors lead to the relative changes in returns—share of oil based inputs in production or something else?

- p. 30: It is true that China exported surplus corn during 2000-06. This was also the period when Chinese officials launched their grain-based ethanol program and jump-started other industrial uses of corn. USDA ERS reports documented the corn exports and expansion of industrial use during this period. Industrial uses of corn (of which ethanol was a minor part) accelerated during 2004-07, helping absorb Chinese corn domestically that would have otherwise been exported. Some of the final products (e.g. citric acid) were exported. During the food price crisis in 2008, China's corn exports stopped abruptly and exports of corn-based industrial products plateaued. That year, Chinese officials used export taxes and other measures to cut off grain exports in order to insulate their market from the global price spike.

- p.31: It is also true that China's soybean imports have risen steadily (since the late 1990s). This reflects expansion of poultry and aquaculture sectors which use a high proportion of protein in feed, and addition of more protein to hog feed as hog-raising shifts from traditional "backyard" to modern modes of production. The increase in animal product consumption and the changes in animal feed demand in China have been underway since the 1980s and there was no abrupt change that contributed to the 2008 food-price crisis. Soybean imports continued rising.

Section 3.4, In Section 3.4, entitled "The Inadequacy of Alternative Explanations for the Rise in Agricultural Commodity Prices," the authors do not mention the MTBE ban, as they file away policy issues such as clean air standards (which are closely related to the oxygenate question) as "inadequate" or distracting explanations of the increase in agricultural commodity prices. If the authors aspire to offer meaningful policy recommendations, then policy issues that motivated the higher current levels of U.S. biofuel consumption should not be ignored. Moreover, they need to interpret any reported increase in U.S. ethanol consumption within the lens of the MTBE ban. The use of MTBE as a gasoline oxygenate in the United States dropped from 3.4 billion gasoline-gallons in 2001 equivalents to zero in 2007. Thus, one can estimate that of the 12.2 billion gallon increase in U.S. ethanol production between 2001 and 2011, as reported in Section 1.3, roughly 28 percent of this increase was due to the MTBE ban.

Another passage with a scant number of works cited is Section 3.4.1, which indicates that "several" studies have examined the contribution of biofuels to retail price increases. The authors cite only one such study.

- P. 36: The authors mistakenly compare data across different years: U.S. exports to Brazil in 2011 are compared with U.S. imports from Brazil in 2012.

- Page 36: The benefit of producing cellulosic ethanol is that agricultural production would take place on land already used for crops (crop residues) or on less productive land. This is not mentioned.

- Page 36: Not all ethanol tax credits have ended; the tax credit for first generation ethanol was ended, not the credit for cellulosic ethanol.

- The opening paragraph of this section fails to mention the severe droughts that have affected global agriculture over the last decade, as well as the market disrupting response in many nations imposing bans, subsidies and taxes on crop exports/imports. These two factors are particularly associated with periods of large increases in crop prices.

- Section 3.1: The opening sentence of the first paragraph in this section says it is important to "distinguish the food price impact which biofuels exerts on malnutrition from its implications for poverty." This phrase appears to be more appropriate if "biofuels is left out, since all the identified effects are caused by all food price increases, not just biofuels.

- This section should include a discussion of the impacts of biofuels on reducing oil use and prices, which is the main motivation and benefit of biofuels, and has a direct bearing on the effects of biofuels on real incomes/poverty.

- The report makes a significant error in equating estimates of reductions in crop supply from simulation models to reductions in food supply, but this is not necessarily correct. As such, taking estimates of crop production from published results and converting these into calories is misleading. An analysis based on the US empirical data (Oladosu et al, 2011) showed that corn use for ethanol can be mainly attributed to large reductions in its use of livestock (within the US) and increased production. Dietary changes are part of responses to change crop prices, so that reductions in the supply of certain crops do not necessarily translate to reductions in calorie intakes in developing countries (Kim et al, 2009). These findings call into question the assumption which underlies the discussion in section 3.1 that crops used for biofuels necessarily lead to malnutrition.

- Check that the phrase "IMAGE model used by researchers at IFPRI" was not meant to be "IMPACT model…".

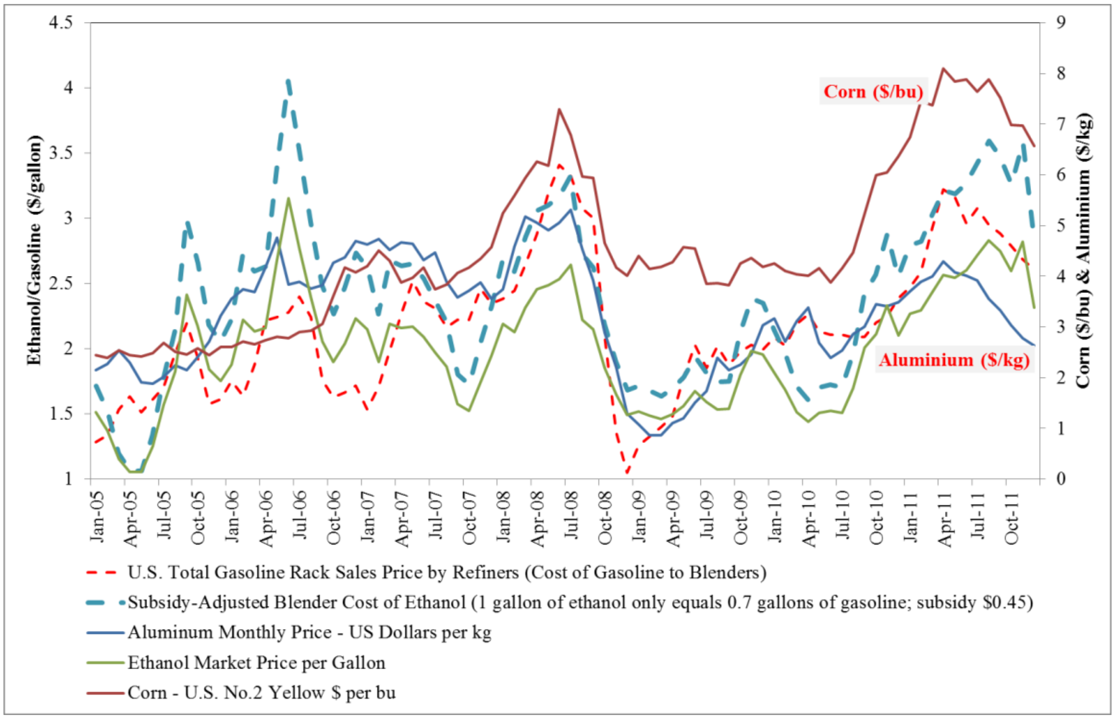
- The last statement on page 22 contains the phrase "extremely substantial" and should be revised.

- Section 3.2: This section presents the papers main argument for holding biofuels responsible for the increase in corn prices in recent years. At the end of section 3.2.1 the authors state this challenge: "Any effort to explain why ethanol would have an effect on crop prices other than the doubling and tripling which we have identified, has to start by offering a cogent explanation of why ethanol producers would not have bid up the price of ethanol near these amounts as oil prices rose." However, this reader notes several deficiencies in this argument itself, as well as the evidence presented by the authors in support as follows:

- The report correctly acknowledges that oil price increases are driving the increase in ethanol prices, which in turn affects corn prices as a component of costs. The question not addressed by the report is what is responsible for increases in the price of oil? One would need to examine both the demand for oil relative to its supply in addressing that question – including all sources of changes in demand and supply. The only fair way to determine the responsibility of each factor to the price change would be to conduct a systematic analysis for apportioning the change in prices. The current report fails to apply this same principle by seizing on a single factor, out of many (biofuels) and allocating all the crop price changes to it. The fact remains that the role of the myriad of factors that have led to increases in not just oil, ethanol and crop prices but almost all other commodities over the last decade, are yet to be established. As such, it is premature and even counterproductive to blame biofuels, particularly in the light of its other potential positive benefits.

- By failing to count the major source of benefits from biofuels, which is its effect in bidding down oil prices, the report unduly castigates biofuels as a source increasing poverty and malnutrition in the world. Given that, as the report acknowledges, biofuels now account for almost 2-3% of total world transportation fuel. The benefit of this contribution to oil prices can be judged by evaluating the impact of a 2-3% extra demand on global oil production over the last decade of tight oil markets. Given that oil is one of world's largest traded commodities even a slight decline in prices has a large real income effect on consumers. This benefit of biofuels must be evaluated against any accompanying increase in crop prices (Oladosu et al, 2012).

- The main analysis used in the report to try to show that ethanol leads to high corn prices is based on the breakeven analysis by Babcock. It would have been much useful to attempt to perform this assessment with actual historical data. The chart below which does exactly that shows that the story is far more complex than the simulation by Babcock would suggest. Importantly, the analysis does not recognize the fact that the equivalent gallon of ethanol seems to forget that ethanol was an expensive substitute for gasoline before the recent spike in gasoline prices – and as such the hypothetical simulation results did not hold until around 2007.



- In addition to the complexity of the ethanol-gasoline margin illustrated above the chart includes the price development for aluminum over the period from 2005 to 2011, which fits the same pattern as corn, gasoline and ethanol prices. Given that aluminum was probably a major material input into the ethanol plants that have been put together over the last decade there is probably an impact on aluminum prices, but it is obviously incorrect to suggest that ethanol prices was the main source of increases in aluminum prices. The fact is that the price spikes in 2007 & 2008 and since 2010, as well as the global price collapse in 2010 originated from a common cause that is yet to be explained, **but not biofuels.**

- The previous observations also eliminate the attempt to make biofuels responsible for the increase in the price of other crops as depicted in Figure 4 of the report relying on a correlation analysis based study. The above pattern of aluminum prices and the type of correlation implies makes this type of analysis of little value. Taken far enough, correlation analysis would suggest that biofuels is responsible for all commodity price increases over the last decade.

- The authors in subsection 3.2.2 "examined" the role of supply and demand, with the main aim of discounting all other factors, but biofuels. The use of differences between the cost and price of maize is like the reference to the above correlation analysis of little value. All it shows is that production costs were lower – but production cost is only one determinant of the ultimate market price.

- Droughts and floods are major sources of short-term changes in the price of agricultural products, and their effects may occur before or after production costs have been incurred. In recent years, expected bounty harvests have been severely reduced in many countries.

The discussion of the effects of recent severe weather events on world agriculture was glossed over in the report. The brief paragraph on page 26 glibly accepted that in some years production has not kept pace with demand, with making any attempts to estimate how much the price impacts were in those years.

- The report is filled with statements that tell the reader to prioritize the demand for biofuels over all other factors in the observed price changes over the last few years, but this is not supported by evidence. Short-term crop price changes are usually caused by unexpected events such as droughts or trade policy changes, not demands that are known by farmers in advance and incorporated into planting decisions.

- Labels on Figures 8 to 10 are unreadable.

- Figures 8 and 9 show the danger of blaming ethanol, which accounted for only 1/3 of the increase in grain use between 2005 to 2012 for all the price increases. What would have been the price increase without biofuels?

- Section 3.3.2 discounts the importance of the rapid decline in Chinese stocks and the change from a net exporter to a net importer of maize, and its dependence on soybean imports. While acknowledging that China's sale of its stocks in the early 2000s probably helped lower world crop prices, the report fails to acknowledge that the same magnitude and opposite effects on world prices would be expected when China because a net importer in 2008. Although the authors acknowledged that the persistent increase in soybean demand by China over almost the entire decade contributed to the tight market, the report goes on to discount its effect by comparing the required land use to that for biofuel production since 2004.

- At the end of section 3.3.2 the report again repeats the idea of prioritizing biofuel demand over other factors responsible for changes in crop prices.

- Section 3.4.2 sought to call other studies that contradict the basic premise of the report into question by labeling these as flawed. In light of the above comments the report's conclusion are perhaps more flawed than many of the shortcoming of the highlighted studies. Incidentally, one method that was called into question is the use of general equilibrium models, but results from one such study formed part of the support for the report's assertion that biofuels lead reductions in crop demands for food.

- Section 3.4.4: the conclusion stated here is unjustified by the analysis since the report makes no effort to estimate the quantitative role of each of these factors on crop prices, but rather blame all the increases on biofuels.

- p.21, the section of Relation to the Poverty. The discussion needs to be based on separating global population into at least four groups: rural farmers in poor countries who produce food for themselves besides selling; the urban poor in poor countries to rely completely on food in market, the urban rich in poor countries; and the population in rich countries. Price increase in agricultural commodity could benefit the first group but hurt the second group the most.

- p.22, last para. These statements are speculative. Modeling studies have been done to address some of these issues. Yet later in the report the authors basically dismissed almost all the economic models for biofuel modeling. Interestingly, one of the authors used one of the dismissed models in his 2008 study.

- p. 22, 2nd para. The authors draw upon conclusions from the MIRAGE model about corn produced for ethanol production without indicating that these results contain inherent uncertainty. One source of uncertainty is that MIRAGE does not include fallow lands that could be used for food production (Djomo and Ceulemans 2012). In general, the authors put great emphasis on LUC modeling results without describing sources of uncertainty and limitations that are inherent to these models. The discussion in Djomo and Ceulemans (2012) is particularly helpful in presenting the advantages and drawbacks of many general equilibrium, partial equilibrium, and other LUC models. In particular, the authors of this report should point out that very little real world data is available to validate model predictions. One exception is the production of corn for ethanol production. While corn ethanol has increased an order of magnitude over the last 15 years, U.S. exports of corn have been nearly flat as has the area of land planted for corn in the U.S. (Wallington et al. 2012). Lands abroad converted to corn could be explained as having done so then independent of the increased production of corn ethanol in the U.S. While these trends do not speak to price fluctuations, they do indicate that increased biofuel feedstock production may be possible with little expansion of cropland, especially if the crop is subject to similar levels of research and development as corn.

- P. 23 – The first paragraph seems highly speculative. As the authors point out at the beginning of this section, there is debate about how much food price increases are due to biofuels. Several studies do not agree with this report's view that "biofuels have played a predominant role in the increases in food prices and volatility since 2004" (e.g., NRC 2011).

- P. 24 and 25 – There are many factors that this analysis does not consider. For example, one reason why land prices are rising is that the newly rich are investing in farm land rather than the stock market. Furthermore, the increases in food prices were primarily due to many interacting factors (other than biofuels): increased demand in emerging economies, rising energy prices, drought in food-exporting countries, cutoffs in grain exports by major suppliers, market-distorting subsidies, the declining U.S. dollar, and speculation in commodities markets. In addition, the analysis does not take not account the decline in area of cultivated land in the US (which has affected the rate of the supply). The report discusses several of these factors doe does not discuss their combined and interacting influence. Finally the analysis is one of correlation rather than cause and effect.

- p.28, first two para. and figure 8. "Viewed another way, for every additional ton of grain for food and feed which farmers have had to produce since 2005, they have had to produce an additional 0.46 tons for fuel." From the data presented in the text it should be stated that "for every additional ton of grain farmers produced since 2005, 0.68 tons go to feed and food and

0.32 ton for fuel," or "for every ton of grain farmer produced for biofuel, additional 0.68 tons of grain produced for feed and food."

- Figures 8, 9 and 10 – The source of the data or the figures should be provided.

- P. 33 – The logic seems circular. By focusing only in biofuels as the cause of price increases, it is found that biofuels explain the change. A causal analysis would be more satisfying than mere correlation.

- p. 36. A cellulosic biomass yield of 18 tons of dry biomass per hectare per year is cited as optimistic. Miscanthus could achieve a yield of 22 dry tons/hectare/year over its life (fifteen years) (Heaton et al. 2004, Heaton et al. 2008). The yield of feedstock is highly dependent on feedstock type.

Chapter 4 Comments: BIOFUELS AND LAND

Specific Comments:

Section 4.1 levels two linked arguments: first, we are already expecting to increase our demands on cropland due to growing population and changing diets; and, second, diverting crops for fuel production will increase the competition for land. There does not seem to be much debate about that general conclusion. However, the discussion of some of the data is inconsistent with the source information cited from current FAO projections to 2050 (Alexandratos and Bruinsma 2012, hereinafter A&B 2012) and demonstrates a misunderstanding of fundamental information in the field by the Report authors.

For example, regarding the discussion of the production and yield increases on p. 38:

> *It [A&B 2012] also assumes that "future crop yield growth will roughly match yield growth in the previous 50 years, a period of staggering productivity gains."* (section 4.1, paragraph 4, sentence 1)
>
> Text on p. 126-127 (A&B 2012) says - to the contrary – that they project a more than halving of the average annual rate of growth relative to the historical period (1961-2007); for cereals [See also Table 4.13] this slowdown in yield growth will be particularly pronounced. (Review note: yield growth <u>levels</u> are projected to continue to increase.)
>
> *Overall FAO [A&B 2012] projects food increase per year over each of the next 40 years [will] exceed annual growth in 1961-2006 in the period 1961-2006. For example, annual cereal growth is projected to grow 6% more per years, oilseeds 29% more, and root crops 46% more."* (section 4.1, paragraph 4, sentences 2 and 3)
>
> A&B 2012 indicate – to the contrary – that demand growth is projected to be half as large as in the historical period (p. 63); "past trends of decelerating growth in demand for food and feed will likely continue and perhaps intensify. However, the trend may be halted or reversed for total demand if the intrusion of energy markets into those for agricultural produce for the production of biofuels were to continue at anything like the rates of the last few years (p. 62)." The report appears to confuse A&B's comments on the level of production growth (which is forecast to increase) with the rate of production growth (which is forecast to decline).

Similarly the discussion of land availability does not convey the nuances of differential availability across regions in A&B 2012.

A subjective tone enters at places with the use of vague and poorly defined terminology: i.e. "Any effort, therefore, to produce **meaningful** quantities of bioenergy would result in **large-scale** competition with the use of land for other human needs or carbon storage." The truth of that statement depends on one's definition of "meaningful" and "large-scale", neither of which are precisely defined, so it isn't clear that this conclusion actually follows from the other estimates of projected land demand that are presented.

The indirect land-use impacts box (p. 40) basically argues that they are not calling for ILUC calculations in public policy because instead calling for abandoning mandates and incentives to divert crops to biofuels in the first place. The discussion appears intended to illustrate that general equilibrium outcomes of increased biofuels are negative (not in so many words), but the discussion is very short and difficult to understand. It also does not take into consideration the full range of indirect market feedback effects, highlighted in other studies, including:

Zilberman, D., G. Barrows, G. Hochman, and D. Rajagopal. (2014, forthcoming). "On the Indirect Effect of Biofuel," *AJAE* 96(2) forthcoming.

Regarding the statement*: "In short, the next four decades will see a large, growing competition for land for food, feed, timber and urban uses even without any increases in bioenergy. Although the prospect probably exists to expand agricultural land if necessary to meet food needs, that would run counter to global goals to maintain carbon stores to resist global warming."* However, technological advances for higher-yielding cultivars -carried out by EMBRAPA and private research- will continue to foster industry growth. Likewise, technological improvements in biofuels processing that lower costs will continue: for example the use of sugarcane bagasse would increase ethanol yields. In the case of biodiesel, it has been suggested (Barros et al., 2006) that allowing the sale of the hydrous ethanol resulting from the biodiesel production process and/or annexing a distillery to the biodiesel plant to process anhydrous ethanol as input into the biodiesel production could significantly lower biodiesel production costs.

- Page 38: The statement that "an increase in world cropland of 69 million hectares hard to achieve" needs further explanation.

- Page 42: The authors mention that one of the limitations of existing biofuel policies is that they make no effort to avoid land use of food competition, but previously they discussed how China and India (and now the EU) have altered their policies to avoid competition for food feedstocks

---

- p.39, second part of the 5th para. The statement regarding potentially available land for biofuel feedstock growth may not supported by evidence. For example, even in the U.S. where statistics of land (especially cropland) is extensive, new analysis revealed that US statistics, as used in some of the CGE models, underestimates the amount of land available in the use. Inparticular, with U.S. Department of Agriculture Cropland Data Layers, Mueller et al. (2012) estimate that in the U.S. 90 million hectares of available lands for biofuel production, which is 28 million hectares greater than the U.S. EPA's baseline of agricultural land that qualifies for biofuel production. . Included in available lands were hay, pasture, grassland, and idle cropland. Wetlands were not included, nor were shrublands. Further, conversion of grasslands to production of switchgrass and miscanthus may sequester carbon rather than cause carbon emissions (Kwon et al. 2013, Mueller et al. 2012).

- p.40, the text box of Biofuels and Indirect Land Use Change. The authors implicitly advocate marginal analysis in examining biofuels' GHG effects. But some of the arguments in the textbox go against arguments made elsewhere in the report. For example, if crops are used for biofuel production and if this switch causes a reduction in food demand (as the authors argued elsewhere in the report for causing malnutrition and poverty by biofuels), this should result in a GHG reduction, not a simple wash off without any carbon impacts. Also, if crop switches occur as a result of biofuel production, then GHG emission difference between the crops before biofuel production and the crops after the biofuel production should be taken into account in biofuel GHG accounting, again not a simple wash off. This textbox is written without consistence with arguments made in other parts of the report.

- P. 39: It is not clear what land types are referenced here: "In addition, as early as 2003, the FAO warned that 60% of this land was covered by forests, protected areas or human settlements." The 2007 FAO/IIASA report (the focus of this paragraph) differentiates land that is previously cleared and underutilized that is available for agricultural expansion without deforestation. Such indefinite references make interpretation difficult.

- P. 39: The categories of "pasture" and "grazing lands" are "catch-all" categories, which include many types of vegetation. Often no or few ungulates use them. Growing biofuel feedstocks may well enhance the carbon storage of those lands (as it has been measured to do in several locations) (Fisher et al. 1994) and may contribute to forage as well. Depending on prior land-use practices, soil carbon and soil tilth can be improved with perennial crops under several management conditions (Tolbert et al. 2002, Mann and Tolbert 2000).

- P. 40: text box on Biofuels and Indirect Land Use Change -- This section and elsewhere assumes that the only way for a farmer to increase yields is by using new land. Yet it is common for farmers to plant more intensely in the field or at the margins of the field when conditions warrant it. Most importantly, the large amount of underutilized agricultural land in the world provides the real potential for growing biofuel crops. Finally the section does not discuss the displacement of fossil fuels (which has carbon implications as well as being a nonrenewable resource).

Chapter 5 Comments

General Comments:

Section 5.2: One could argue that all land in developing countries has the gender dimension issue. Is this case different? If not, it would be valuable to place this discussion in the larger context. If yes, highlighting the differences would be valuable.

- p. 42: The 2011 report of the International Land Coalition (ILC) that is mentioned is not in the list of citations. It was hard to determine which of the many ILC reports was being referenced – so I read several of them and assume the authors are referring to "Land Rights and the Rush for Land."

- P. 42: It is not clear what is meant by the "land grab phenomenon." On searching the web information on LCI, I found that "land grabbing" is defined by ILC as being "Acquisitions or concessions that are one or more of the following:
  1. in violation of human rights, particularly the equal rights of women;
  2. not based on free, prior and informed consent of the affected land-users;
  3. not based on a thorough assessment, or in disregard of, social, economic and environmental impacts, including the way they are gendered;
  4. not based on transparent contracts that specify clear and binding commitments about activities, employment and benefit sharing, and;
  5. not based on effective democratic planning, independent oversight and meaningful participation."

The implication is the "land investments" are bad for the people and the land, but not enough information is provided to evaluate the specific cases being discussed. In many situations such attributions to biofuels are not based on real cause and effect relationships. In some cases land was initially cleared and subsequently put into growing biomass feedstocks; yet biofuels are given the blame for the initial land clearance (Dale and Kline 2013).

- P. 42 to 47 – This section blames biofuels for the problems in land grabbing, but the ILC (2011) report cites key failures of governance. The policy considerations suggested by ILC (2011 mirror the recommendations in this report. This report holds biofuels to account for governance problems, which is odd and incorrect. It is more direct and appropriate to place the problems with governance issues so that the next new land use is not allowed to take advantage of long-term governance problems. For example when I look at Table 3, I wonder, if it weren't to for biofuel feedstocks, what would be in column 5. Surely land pressures would not go away and this report even point out that "developing countries need investment in agriculture"(p. 48).

- P. 48-52 – Similar to the situation above, biofuels are inappropriately blamed for gender discrimination problems.

- P. 52 – The report should also mention the costs and difficulty of obtaining the numerous measures in proposed certification schemes (Dale et al. 2013).

Appendix II Comments

This discussion focused on critiquing one reference that has analyzed the role of inventories in the analysis of factors affecting food prices. A more balanced discussion would include a more complete selection of the literature on the topic, including:

Hochman, G, D. Rajagopal, G. Timilsina, and D. Zilberman, The Role of Inventory Adjustments in Quantifying Factors Causing Food Price Inflation. World Bank Policy Research Working Paper 7544, August 2011.