DRAFT

ARB Indirect Effects Expert Workgroup

Food Effects Subgroup

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The Expert Work Group's attention is principally focused on the global warming (GW) effect of indirect land use change (ILUC) induced by displacing fossil or other fuels with biofuels and other fuels, but biofuels have other non-GW consequences. In particular, the ILUC mechanism operates largely through international markets for food commodities and their substitution in production decisions, so the non-GW effect most closely tied to ILUC modeling is biofuel effects on nutrition, diet, and food prices. These effects are not uniformly consequential across populations or–especially–income groups.

First-generation biofuels are nearly all made from food crops, and their competition with food is direct, as bidding feedstocks away from food and feed use raises prices of agricultural commodities. Second-generation biofuels generally, compete with food, feed and fiber for land and will have higher per-acre yields, and therefore represent a smaller effect on food prices. Use of crop residue cellulosic feedstock can even increase food production.

The "food-versus-fuel" arena of biofuel debate was particularly active just after the 2008 spike in food prices, which had multiple causes including not only biofuel growth but also energy prices, agricultural research, trade policy, and more. The effect of biofuel mandates and promotion on food price and availability continues to be salient, as do the other factors, at least in the view of the market (corn futures prices for 2013 are higher by about 7% per year than current spot prices).

The research literature on this issue presents widely varying estimates of the specific, independent, effect of biofuels growth on food availability and cost but is unanimous in finding lower consumption and higher prices. The overall benefit/cost balance of price increases for commodity grains and seeds is less clear, for several reasons. First, commodity food prices have a relatively small proportional effect on food prices, but are a larger component of meat costs than of other food costs because meat is so grain-intensive, so higher prices may partially result in a healthier diet for people who would otherwise eat a lot of meat and might not affect nutrition generally very much, at least for high-income populations. Second, subsidized export grain prices have been blamed for injuring poor countries' agricultural sectors and higher prices might enable developing countries' rural regions to recover their traditional economic viability. In any case, the market role of co-products from biofuel production, such as distillers dry grains, need to be included in these calculations to develop a comprehensive understanding of the

interdependencies of these systems.

This subgroup, to date mainly occupied with a literature review, will engage two aspects of the "food issue":

I. Comparing and evaluating existing estimates of the world food price and consumption effects of increased biofuel production. This element will describe these estimates and where possible critique and evaluate different models and methods used to obtain them. As other subgroups are focused on general reliability and accuracy of the economic models used for ILUC estimation, our attention will be restricted to how food effects are modeled.

II. (Seek to) develop mechanisms whereby food effects can be incorporated in ARB's implementation of the LCFS, and recommend whether they should be. The central challenge is that the LCFS refers generally to so-called "sustainability" concerns, but as implemented, only consequentially counts greenhouse gas (GHG) emissions for particular fuels. One study estimates ILUC values holding food consumption constant, an approach that might be considered a measure of the GW equivalent of food effects. Another approach might be to calculate or estimate the "GW price of food consumption reduction" and use it, with a food effect estimate, as an additional term in fuel GWI. Still another is to present food effects as estimated but allow other regulatory or subsidy policies to respond to them.

Selected References:

FAO (2008). SOARING FOOD PRICES: FACTS, PERSPECTIVES, IMPACTS AND ACTIONS REQUIRED, Food and Agriculture Organization of the United Nations.

FAO (2008). The State of Food and Agriculture--Biofuels: prospects, risks and opportunities. Rome, Food and Agriculture Organization of the United Nations**:** 138.

Hertel, T. W., A. Golub, et al. (2010). "Global Land Use and Greenhouse Gas Emissions Impacts of U.S. Maize Ethanol: Estimating Market-Mediated Responses." BioScience **60**(3): 223-231.

Meyers, W.H. and Meyer, S., (2008). Causes and Implications of the Food Price Surge. Report # 12-08, FAPRI Columbia, MO, University of Missouri.

Msangi, S., M. Ewing, et al. (2010). Biofuels and Agricultural Growth: Challenges for Developing Agricultural Economies and Opportunities for Investment. Handbook of Bioenergy Economics and Policy,. M. Khanna ed., Springer Science**:** 73-91.

Msangi, S., M. Ewing, et al. (2010). Biofuels, Food Security, and the Environment: A 2020/2050 Perspective. Global Change: Impacts on Water and Food Security. C. Ringler, ed. Berlin, Springer-Verlag**:** 65-94.

Sexton, S., D. Rajagopal, et al. (2008). "Food Versus Fuel:How Biofuels Make Food More Costly and Gasoline Cheaper." Agricultural and Resource Economics Update **12**(1).

Taheripour, F., T. W. Hertel, et al. (2010). Implications of the Biofuels Boom for the Global Livestock Industry: A Computable General Equilibrium Analysis*. GTAP Working Papers. West Lafayette, IN, Purdue University.

Trostle, R. (2008). Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices. Washington, DC, Economic Research Service, USDA.