Comments on ARB’s “Indirect Land Use Technical Considerations”

RFA
January 30, 2009
Preliminary Comments

• These are our preliminary comments, we will submit detailed written comments shortly
Adjustment for Yield Improvements

• Ethanol is being shocked from 2001 to 2015 (13.25 bgy), but yield improvements only evaluated from 2001 to 2007-08 (8.7%). This is inconsistent.
• USDA projects yield improvements of 23% from 2001 to 2015.
• ARB is only applying yield improvement to newly converted land. What about the yield improvement on all the other hectares, for example, the 31 mha of land in corn in 2015?
  – Assumption of balanced demand increase and yield improvements?
  – What if this is not the case? Any data? Sensitivity analysis?
DG Land Use Credit

• Purdue’s data used for GTAP confirms Argonne report of greater than 1 lb of meal being replaced by 1 lb of DGs (DG ratio)
• Argonne study indicates DGs replace corn and soy, not just corn - quite a detailed study based on survey data
• ARB should carefully evaluate Argonne study (if not already done)
  – Provide clear explanation of what assumptions or estimates ARB disagrees with and why
Distillers Grains Land Use Credit

Corn → Plant → Energy Credit → Distillers Grains → Land Use Credit

Soybeans → Agricultural Feed
Land Use Credit versus Percent Soy in Base Feed and DG Ratio

<table>
<thead>
<tr>
<th>DG Ratio</th>
<th>Line Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.28</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>1.20</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>1.10</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td>Black</td>
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</tbody>
</table>

GTAP

Argonne

Percent Land Use Credit

Percent Soy in Base Feed

Air Improvement Resource, Inc.
DG CoProduct Credit for Corn Ethanol

• It’s the coproducts that makes sugarcane ethanol impact relatively low
  – Electricity: easy to measure output
• Same is true for corn ethanol
  – A little harder to estimate than electricity - 3 or 4 types of animals, but still can be done
Grassland Emissions

• We have concluded that use of Woods Hole is best there is for now
Conversion of Forest

- A lot of evidence that carbon is stored in building products, whether in the building or in landfills
  - Actually, a lot of evidence that paper is stored for a long time in landfills as well, and some of this is recycled also
- 50% of above ground carbon goes to paper and building products (1/2 and 1/2)
- Purdue is now assuming 25% of above ground mass is stored in building products (conversion of above ground mass)
New Issue - Reduced Enteric Fermentation

• Cattle fed DGs have shorter time to market, and reduced enteric fermentation
• Detailed evaluation in Argonne DG report
• Amounts to 3 g CO2/MJ ethanol
### Summary of Effects (approx)

**g CO2 eq/MJ**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cumulative Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start: ARB Corn LUC Estimate (30 yr annualized)</td>
<td>30</td>
</tr>
<tr>
<td>Consistent Years Yield Effect in Excess of ARB Effect (-5)</td>
<td>25</td>
</tr>
<tr>
<td>Argonne DG LU Credit in Excess of Current GTAP LU Credit (-13)</td>
<td>12</td>
</tr>
<tr>
<td>25% Carbon Storage in Bldg Products Forest Effect (-3)</td>
<td>9</td>
</tr>
<tr>
<td>Reduced enteric fermentation (-3)</td>
<td>6</td>
</tr>
</tbody>
</table>
These Adjustments Are Reasonable

- **Yield**: Consistency. Also, yield improvements on all other land available to satisfy demand increases.
- **DG Credit**: Tell us what is wrong with the Argonne analysis (or our interpretation), we think it is done correctly.
- **Carbon storage in building products**: Only assuming 25% is stored in buildings or landfills, probably higher than this.
- **Reduced enteric fermentation**: Cattle produce a lot of GHGs. Any small reduction here can be significant.
How Big is the LUC Effect for Corn Ethanol?

• Not big

• Plants on average getting more efficient as well (recent Cassman, et al UNL report)

• Corn ethanol can be an important component of the portfolio needed to achieve the LCFS
Thank you