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April 13, 2009

Clerk of the Board
Air Resources Board
1001 I Street
Sacramento, CA
95814

Dear Clerk of the Board:

We are submitting this comment regarding the proposed regulation to implement the low carbon fuel standard. It is generally agreed that the rapid expansion in U.S. corn based ethanol use beginning in 2006 has had an impact on crop prices and crop land use patterns in the U.S. Current legislation implies that use of corn-based ethanol will continue to expand, with the bulk of the mandate of 15 billion gallons of renewable biofuels use by 2015 to be met by corn based ethanol. The U.S. and world crop land use impact of such an increase is less than straightforward. The analysis of such impacts must recognize the dynamic effects of changing commodity prices on the level of crop consumption and the implications for total U.S. and world crop production that is needed. The analysis must also be able to separate the crop land impact of the increased use of corn based ethanol in the U.S. from changes in other variables such as world economic conditions and trade policy.

As a starting point, any analysis must correctly identify the direct implications of the amount of U.S. corn acreage that will be needed to meet the mandated level of renewable biofuels production by 2015. Starting with the annual mandates of use through 2015, assuming that those mandates will be met primarily by corn production, and assuming a continuation of the current average yield of ethanol per bushel of corn (2.86 gallons per bushel based on a recent study conducted at the University of Nebraska[1]), the amount of corn needed for each corn marketing year through 2015-16 can be calculated. Those calculations are shown in Figure 1 (attached). Corn use for ethanol production in 2008-09 is projected at 3.7 billion bushels by the USDA and 5.2 billion bushels would be needed in 2015-16 to meet the mandate of 15 billion gallons.

Next, the acreage of corn needed to meet the production level implied by the mandate can be calculated based on an assessment of the likely average yield of corn each year to 2015. As indicated in Figure 2, the U.S. average corn yield has trended higher in a linear fashion since 1960. The trend increase has been 1.87 bushels per acre per year. Many believe that average yield will show a steeper trend in the future. However, a continuation of the current trend results in a calculated trend yield of 164.3 bushels per acre by 2015.

[1] Perrin, R.K., N.F. Fretes, and J.P. Sesmero. "Efficiency in Midwest US Corn Ethanol Plants: A Plant Survey." *Energy Policy* 37(2009):1309-1316.

Finally, the calculation of the net increase in corn acreage needed to meet the projected level of corn use for ethanol must recognize that 30 percent of the raw corn used for ethanol production is not consumed in the distilling process, but is available as a livestock feed. That availability substitutes for other feeds, including corn, reducing the acreage required for the production of those feeds.

The net corn acreage needed for actual ethanol use from 2005-06 through 2007-08, projected ethanol use in 2008-09, and the mandated level of use from 2009-10 through 2015-16 is shown in Figure 3. The increase from 2005-06 to 2015-16 totals 14.9 million acres. In absolute terms, that is a large increase. However, the increase represents less than 0.7 percent of world crop land in 2008. The increase in U.S. corn acreage required to meet the renewable biofuels mandate from 2008 to 2015 totals only 5.6 million acres, or about 0.24 percent of the world crop land in 2008.

It is our opinion that any analysis of the indirect land use impact of U.S. renewable biofuels mandates must be approximately consistent with the calculations presented here. The most important point is that U.S. mandates for corn-based ethanol through 2015 will use a very small proportion of the world's crop land. There is a real danger that since the acreage impacts are so minuscule that they cannot be accurately modeled in a formal manner.

Sincerely,

Darrel L. Good
Professor

Scott H. Irwin
Laurence J. Norton Chair of Agricultural Marketing

Figure 1. Actual Use, Projected Use, and RFS Mandate for Corn Based Ethanol, 2005/06 - 2015/16 Marketing Years

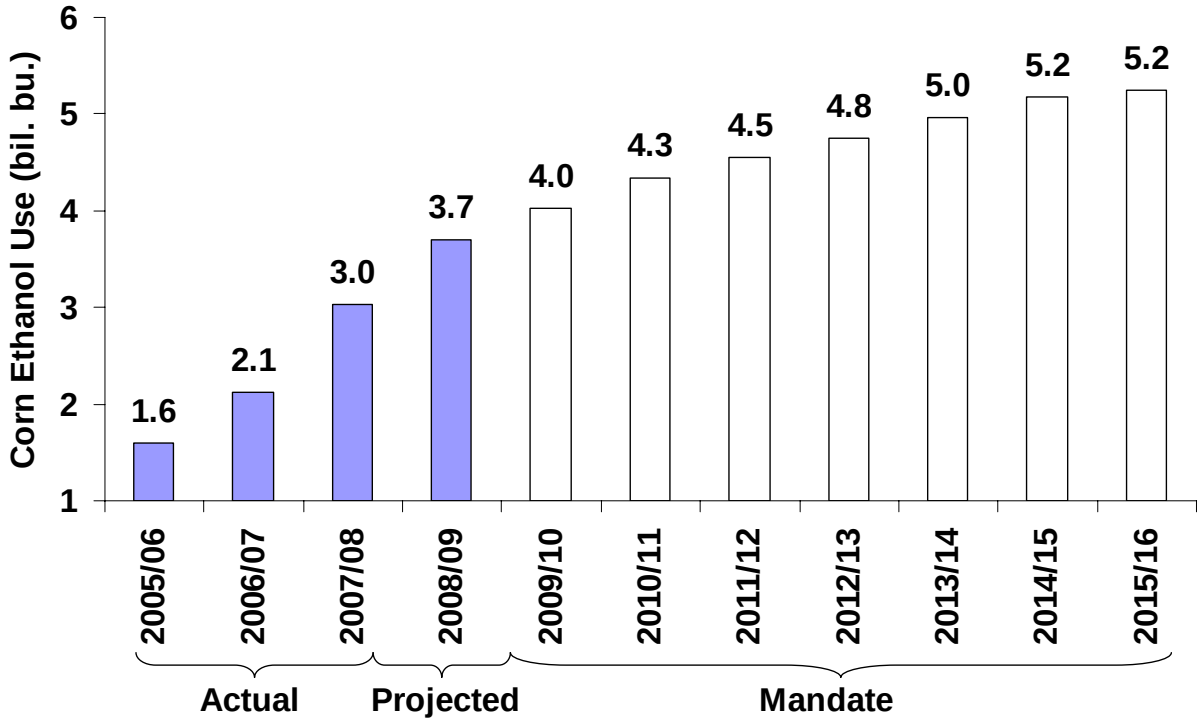

Figure 2. Actual and Projected U.S. Average Corn Yield, 1960 - 2015

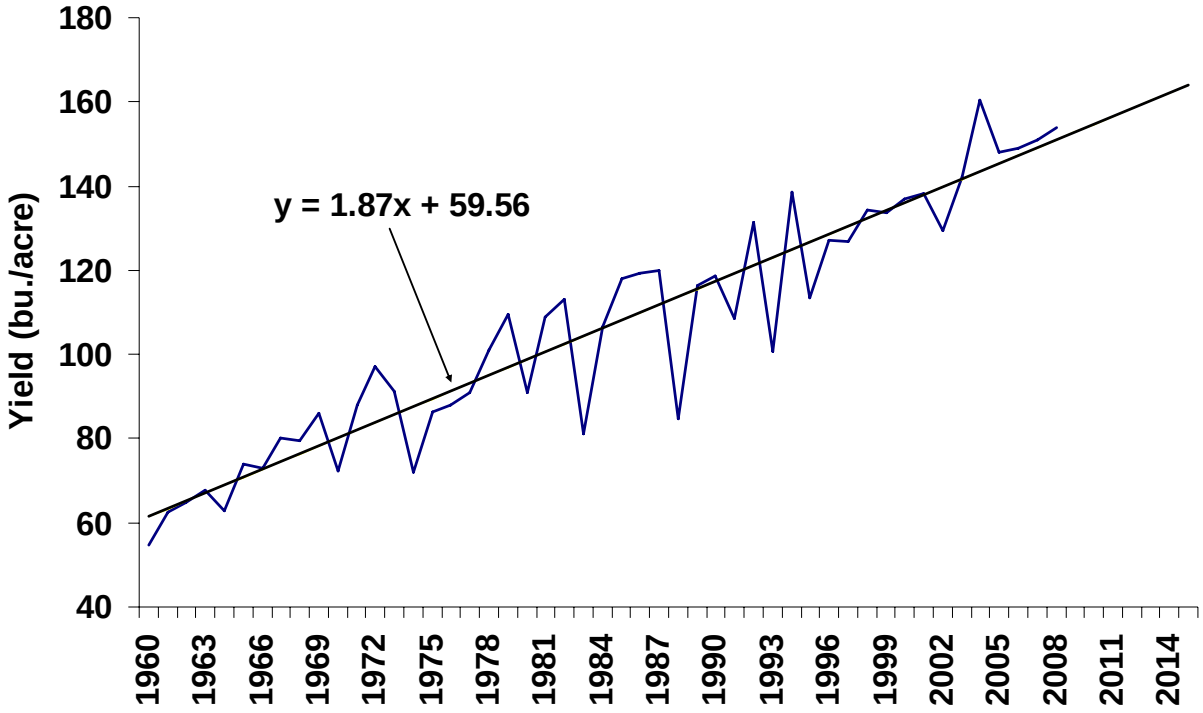

Figure 3. Net Corn Acreage for Actual Use, Projected Use, and RFS Mandate for Corn Based Ethanol, 2005/06 - 2015/16 Marketing Years