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December 5, 2014

Katrina Sideco
Staff Lead
LCFS Reconsideration Team
California Air Resources Board
Submitted via electronic mail to katrina.sideco@arb.ca.gov

Re: Official written comments from the National Biodiesel Board on Low Carbon Fuel Standard Indirect Land Use Change Analysis

Dear Ms. Sideco:

The National Biodiesel Board (NBB) has developed the following comments on the draft indirect land use change (ILUC) analysis presented at the CARB workshop on November, 2014. The NBB appreciates the effort that CARB is undertaking to improve the GTAP ILUC modelling and looks forward to CARB finalizing the new ILUC factors. Incorporating the latest data and modeling techniques that have been vetted publicly and by experts in the field will substantially improve the robustness and integrity of the Low Carbon Fuel Standard (LCFS).

Elasticity of Land Transformation

The NBB commends CARB staff for following the recommendation of the Expert Workgroup to address the Elasticity of Land Transformation (ETL). Adopting the land supply structure in the current GTAP model is an appropriate improvement over the former structure. The NBB strongly supports CARB's adoption of the new nesting structure in GTAP which recognizes the economic reality that cropland and pasture are more likely sources of land for new commodity production rather than converting forested land to crop production.

Yield Price Elasticity

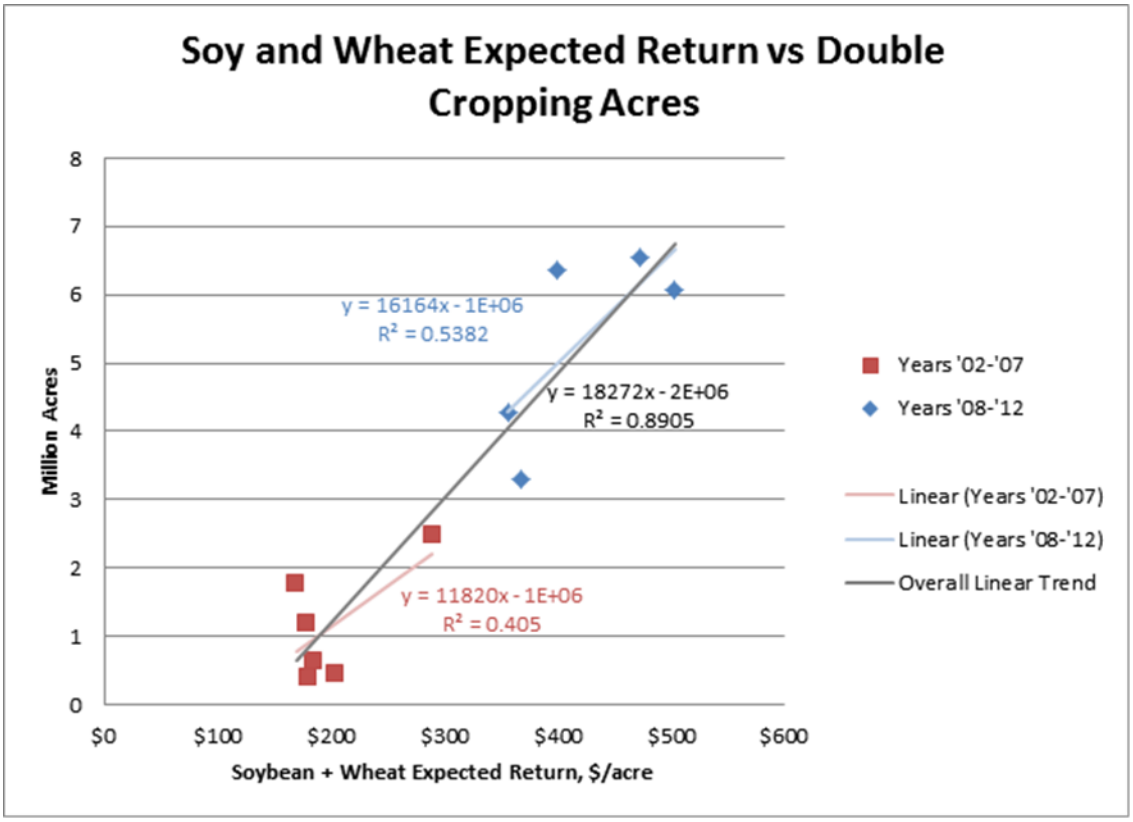
The NBB is pleased to see that the Yield Price Elasticity (YPE) can now be set independently for each crop by region. This new flexibility, combined with the new ETL structure should make it easier to update the model in the future to include cropland pasture in countries other than the United States and Brazil and to include the impact of double cropping for the crops and regions where that is a common practice. The response in crop yield with respect to crop price is an important factor. It quantifies the very real phenomenon that farmers respond to high crop prices by investing in new technology that makes their operations more efficient. Optimizing the yield per acre is always an objective for farmers wishing to increase their profit margin. When commodity prices increase, this not only increases incentive for farmers by increase the return on investment, but it also improves their access to capital with which to make additional investments in yield-improving technology.

Until such time that crop-specific and regionally–specific data are available to support different yield price elasticities within the model, the value of 0.25 should be used for general crops. 0.25 is the value recommended by the CARB Expert Workgroup. 0.25 is the default price yield elasticity in the GTAP model as maintained by Purdue and is used by the global network of GTAP users worldwide. CARB has

suggested a range of price yield elasticities. The central value of the elasticities used by CARB strays from the value of 0.25. Sound scientific rationale has not been presented for lowering the central value of YPE or suggesting that 0.25 is not correct for general crops. The 0.25 value in GTAP was chosen to be the medium term value, which is right for the model.

Beyond using the correct default YPE, there is a strong scientific rationale for using a higher YPE specifically for regions where double cropping is occurring.

We have previously supplied you some analyses that documents the relationship between the double cropped area in the US and the expected return of wheat and soybeans. That is shown in the following figure.



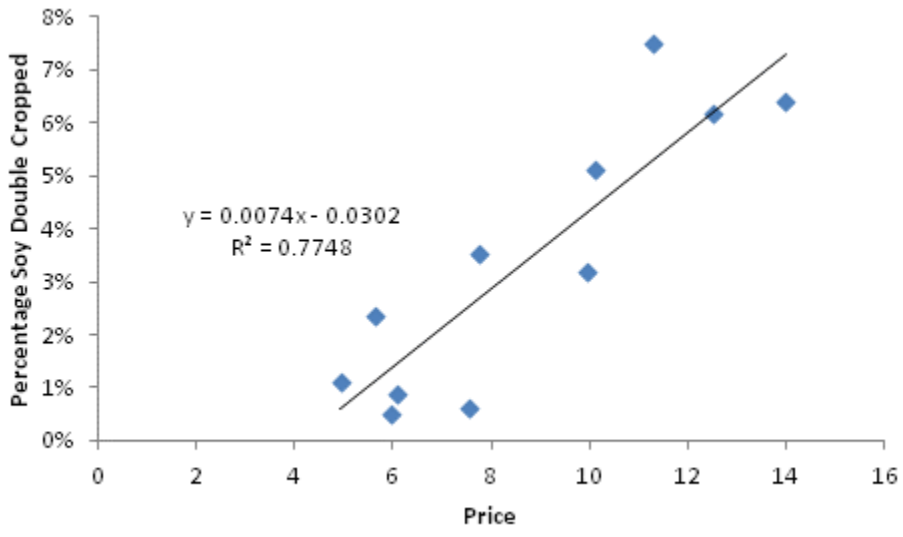
There has been an increase in the double cropped area in the United States of over 6 million acres between 2004 and 2012. Most of this double cropping involved wheat and soybeans. Using a higher value of YPE for US soybeans is therefore entirely appropriate and one way for the model to be able incorporate this important ILUC mitigation strategy.

Work by Ploughman (2014) quantifying price yield elasticity has demonstrated that when prices are high, there is a significant increase in double cropped soybean acres. One of the challenges within the current GTAP framework is that there is no way to directly account for production that does not require land, which is what happens when double cropping occurs. However, a modified YPE could be used to account for double cropping in the existing model structure.

To facilitate the calculation of a modified YPE, the price of soybeans (USDA, quickstats) was plotted versus the percentage of soybeans that were double cropped for the years 2000 - 2012. The result can be seen in the as follows:

Summary of Soybean Double Cropping Data

YEAR	USDA Avg Price, $	Ploughman Double Cropped Soybeans, Acres	USDA TotalSoy Acres	% soybean acres double cropped
2002	4.93	815,589	72,497,000	1.12%
2003	6.08	646,020	72,476,000	0.89%
2004	7.56	450,212	73,958,000	0.61%
2005	5.95	358,423	71,251,000	0.50%
2006	5.65	1,771,710	74,602,000	2.37%
2007	7.74	2,269,176	64,146,000	3.54%
2008	11.3	5,594,801	74,681,000	7.49%
2009	10.1	3,913,689	76,372,000	5.12%
2010	9.97	2,433,277	76,610,000	3.18%
2011	12.5	4,565,514	73,776,000	6.19%
2012	14	4,884,086	76,164,000	6.41%



Price elasticity is calculated by the following equation:

Elasticity = slope * Price / Quantity

Because 2009 was on the trend line, it was chosen as a base year. The implied elasticity, therefore, is .0074 * 10.1 / .0512 = 1.46

These results demonstrate that double cropped soybeans are very responsive to price. Comparing 2012 to 2004, over 4.4 million additional acres of soybeans were double cropped, resulting in over 2.1 billion pounds of soybean oil. In 2012, the total soybean feedstock for biodiesel production was 4.04 billion pounds. The large increase in double cropping relative to biodiesel demonstrates why the effective yield price elasticity of these acres is so high. While this effective yield price elasticity is higher than the default YPE of 0.25 that should be used for crops in general, it is important to note that this method is capturing a very real effect that is quantified here specifically for soybeans. Previous work to quantify YPE has not included double cropping, which in 2012 accounted for 6.4% of the soybean acres. Adopting a YPE of at least 0.25 + 0.064 *(1.46) = 0.34344 for soybean is an appropriate way to include double cropping in addition to other tools that farmers use to increase productivity during periods of high return.

Having demonstrated here that a YPE of 0.34 would be appropriate for soybeans, the central value of 0.19 that CARB has used is exceedingly low to accurately predict the indirect impact of biodiesel in the LCFS.

The method illustrated here for soybeans could also be used to approximate the impact of double cropping other commodities. The US, Brazil, India, China, and Southeast Asia have all demonstrated increasing adoption of double cropping as a method of increasing total crop output without increasing crop acres. It would be appropriate to add a factor of 0.10 to YPE in each of these regions to account for double cropping.

Canola

NBB supports the revisions to the ILUC analysis for Canola when the new land supply structure and the new ETL values. CARB also made an important correction by using a demand shock consistent with biofuel policies of North America.

Emission Factor Models

CARB should consider using the (Carbon Calculator for Land Use Change from Biofuels Production (CCLUB) model which was developed for Argonne National Laboratory for estimating emissions of land use change. Like the AEZ-EF model, CCLUB was designed to be integrated with GTAP. CCLUB has several advantages that provide robust emission estimates for areas most likely affected by biofuel crop increases. CCLUB uses the CENTURY model, which contains much more specific information on soil carbon for the US. CCLUB also uses county-by-county carbon data from forest ecosystems for the US from the Carbon Online Estimator (COLE) database, developed by Van Deusen and Heath in 2010 and 2013. For areas outside of the US, CCLUB utilizes Winrock emissions.

At the very least CCLUB should be used for the emission factors for cropland pasture conversion. CCLUB is using a well-supported model to arrive at the change in soil carbon for cropland pasture that is converted to cropland. The AEZ-EF model is just using a guess for this emission factor based on a percentage of the pasture to cropland conversion emission factor. There is no scientific support for that guess.

CARB has conducted uncertainty analysis of its land use estimates using only AEZ-EF and GTAP. It was mentioned at the November 20 workshop that it would be too labor intensive to set up the computer programing to include CCLUB factors in the uncertainly analysis. While we appreciate the time and resource constraints, failure to include more relevant emission factors skews the results of the uncertainty analysis and limits it usefulness for guiding LCFS policy.

Idle Land

The GTAP model is still over predicting ILUC emissions because it does not properly account for idle cropland around the world. This idle land is available for crop production. However, this idle land is not accessed by the GTAP model. In GTAP, there is an observable difference between amount of available cropland and the land used to produce crops of over 200 million hectares. This land is located in every region of the world. Evidence in the previously submitted Ray and Foley paper and in the recent Babcock and Iqbal paper shows that this land has been the major source of the increase in harvested area in the past decade. While the current version of GTAP is much improved relative to previous versions, the failure of the model to access idle land is a major shortcoming. We suggest this be identified in CARB's long term schedule for GTAP improvements.

We look forward to improving the accuracy of all biodiesel pathway assessments. We welcome any question you have about these comments or requests for further clarifying data.

Sincerely,

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