July 14, 2010

MEMORANDUM

TO: **Air Docket EPA-HQ-OAR-2010-0133**

SUBJECT: **Canola-Based Biodiesel Lifecycle Greenhouse Gas Emissions**

This memorandum accompanies information related to the Environmental Protection Agency's (EPA) analysis of lifecycle greenhouse gas (GHG) emissions for canola oil biodiesel. As explained in the Notice of Data Availability (NODA), our analysis utilizes several data sources and models. To facilitate public review, below is a brief description of the informational materials which accompany this memorandum under the same docket number.

1. Lifecycle Analysis Inputs and Assumptions
This document lists EPA's key modeling inputs and assumptions, including citations for supporting data.

2. Canola-Based Biodiesel Lifecycle Analysis Results
This spreadsheet integrates results from all stages of the fuel lifecycle to calculate canola-based biodiesel lifecycle GHG emissions. The lifecycle GHG reductions are calculated as percent emissions reductions compared to a 2005 petroleum baseline, in this case diesel fuel.

3. Lifecycle Analysis Impact Calculations
This spreadsheet calculates GHG emissions per unit of canola-based biodiesel. The spreadsheet integrates results from of each stage of the renewable fuel lifecycle (e.g., feedstock production, domestic and international agricultural emissions, fuel transport and distribution). The only piece of the lifecycle analysis not calculated in this spreadsheet is the emissions from international land use change. The results from the impact calculation spreadsheet are used in the results spreadsheet, which compares the lifecycle GHG emissions of canola-based biodiesel with the 2005 petroleum baseline.

4. Domestic Agricultural Projections from the Forest and Agricultural Sector Optimization Model (FASOM)
This spreadsheet includes raw results from the FASOM model. FASOM results are used to estimate lifecycle greenhouse gas (GHG) emissions produced by the domestic agricultural sector.

5. GHG Factors from the Forest and Agricultural Sector Optimization Model (FASOM)
This spreadsheet includes results from the FASOM model converted into the format needed to calculate domestic agricultural sector and land use change GHG calculations. These results are input into the impact calculation spreadsheet to convert the results to GHG emissions estimates associated with canola biodiesel.

6. International Agricultural Projections from the Food and Agricultural Policy Research Institute Center for Agricultural and Rural Development (FAPRI-CARD) Model
This spreadsheet includes raw results from the FAPRI-CARD model for a canola oil biodiesel scenario. FAPRI-CARD results are used to estimate lifecycle greenhouse gas (GHG) emissions produced by the international agricultural sector.

7. Calculation of Canola Biodiesel International Agricultural Impacts from the Food and Agricultural Policy Research Institute Center for Agricultural and Rural Development (FAPRI-CARD) Model
This spreadsheet includes EPA's calculations to convert the raw FAPRI-CARD model results data into differences between scenarios to determine biofuel-induced GHG emissions impacts in the international agricultural sector associated with canola oil biodiesel production.

8. Stochastic International Land Use Change Model Results
This Excel-based model is used to perform EPA's stochastic analysis of international land use change GHG emissions impacts induced by canola-based biodiesel. The results from this model are input into the results spreadsheet to calculate a 95% confidence range for lifecycle GHG emissions.

9. Foreign Agricultural Chemical Impact Calculations
This spreadsheet includes data about agricultural fertilizer inputs in foreign countries. It is used to project lifecycle greenhouse gas (GHG) emissions produced by additional crop production in foreign countries. Specifically emissions associated with:

Fertilizer, pesticide and herbicide use per hectare of foreign crop production;
Nitrous oxide emissions per metric ton of foreign fertilizer application;

Upstream emissions from fertilizer production are calculated separately in the impact calculation spreadsheet.

10. Foreign Agricultural Energy Use Calculations
This spreadsheet includes data about agricultural energy use in foreign countries. It is used to project lifecycle greenhouse gas (GHG) emissions produced by additional crop production in foreign countries. Specifically emissions associated with:

Energy use per hectare of foreign crop production

11. Foreign Agricultural Rice Methane Calculations
This spreadsheet includes data about rice methane emissions in foreign countries. It is used to project lifecycle greenhouse gas (GHG) emissions produced by additional crop production in foreign countries. Specifically emissions associated with:

Methane emissions per hectare of foreign rice production