PRELIMINARY DRAFT DISTRIBUTED FOR PUBLIC COMMENT

December 14, 2010

Summary of California-modified GREET Pathway for Conversion of North American Canola to Biodiesel (Fatty Acid Methyl Esters-FAME)

Introduction

The North American canola biodiesel pathway includes canola farming and canola oil extraction in Canada, followed by transportation of canola oil to the U.S.; canola oil is then transesterified to biodiesel and transported to blending stations for use in an internal combustion vehicle in California. A schematic of this pathway is shown in Figure 1. The Canadian canola production is about 95 percent[1] of the "Canola Region" that includes Southern provinces of Canada and the Northern tier states of the U.S., such as North Dakota (Figure 2).[2]

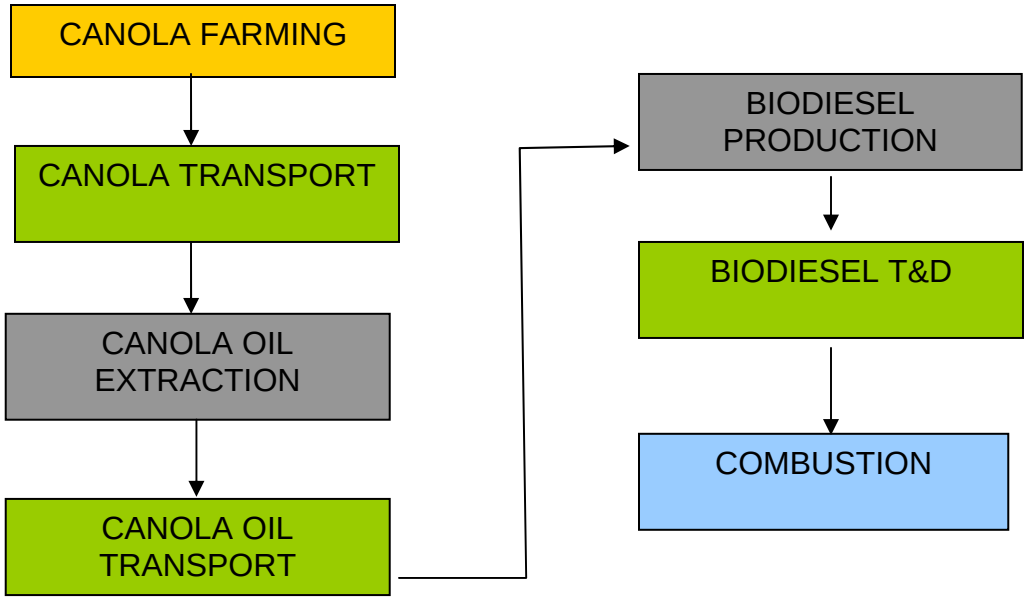

Figure 1. Discrete Components of the North American Canola to Biodiesel Pathway

It is assumed that the Southern Canadian provinces and North Dakota occupy a similar agro-climatic zone, with similar Canadian and American canola farming practices. This pathway is therefore available for feedstock in the "Canola Region" of the U.S. and Canada for farming and oil extraction. The biodiesel production however, is assumed to occur in the U.S.

[1] U.S.D.A., Foreign Agricultural Services website: http://www.fas.usda.gov/psdonline/psdResult.aspx

[2] Canola Council of Canada website: http://www.canolacouncil.org/gallery/726/canola_growing_region_map.aspx

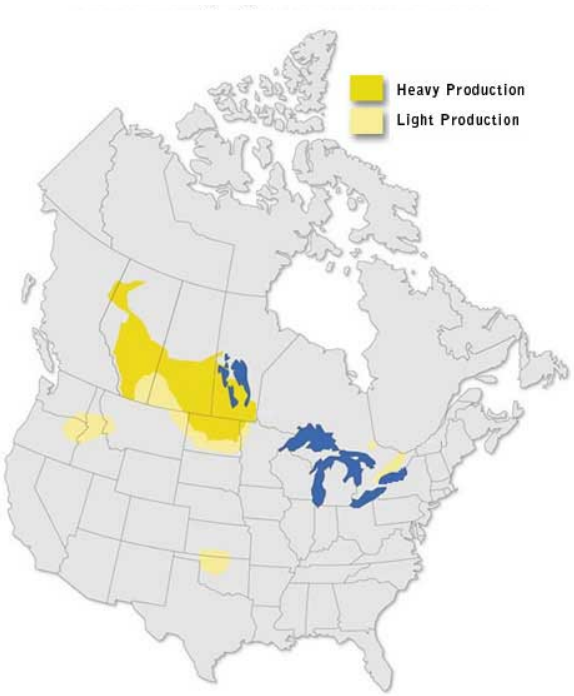

Figure 2. Canola Growing Regions of Canada and the U.S.

Carbon Intensity of Biodiesel

The carbon intensity (CI) of canola pathway, as estimated by the ARB staff is **62.99 gCO2e/MJ** of biodiesel fuel produced. This CI value consists of indirect land use impacts of **31 gCO2e/MJ** and direct GHG emissions of **31.99 gCO2e/MJ**. Staff chose the indirect emissions from the U.S. Environmental Protection Agency's Renewable Fuel Standard 2, for international land use[3], pending ARB's GTAP analysis. Staff estimated direct emissions using the CA-GREET model. The following table shows the breakdown of the GHG emissions:

[3] Federal Register / Vol. 75, No. 187 / Tuesday, Sept. 28, 2010 / Rules and Regulations, TABLE II–1 —LIFECYCLE GHG EMISSIONS FOR CANOLA OIL BIODIESEL, pages.59628-9.

Source of GHG Emissions	GHG Emissions (gCO2e/MJ)	Share of Total Direct Emissions (%)
Canola Farming (including ag. chem. prod. & use)	16.45	51.42
Canola Transport	0.49	1.53
Canola Oil Extraction	2.65	8.28
Canola Oil Transport	1.18	3.69
Biodiesel Production (transesterification process)	5.20	16.27
Biodiesel Transport & Distribution	1.56	4.89
Biodiesel Combustion	4.45	13.91
Total Direct Emissions [a]	**31.99**	**100.00**
Indirect Emissions (from USEPA)	**31.00**	
Total Emissions	**62.99**	

[a] The total may not add up correctly due to rounding.

Staff will revise the indirect emissions estimate when GTAP analysis for canola is completed. In the interim, staff believes that the estimated CI value represents a canola-to-biodiesel pathway for North America's Canola Region.

Staff recommends approval of the North American Canola Pathway described in the accompanying pathway document.