

Economic and Environmental Impacts of Biofuel Policy in Canada

Topic: Environmental input-output modeling I

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Abstract

The Government of Canada has committed that Canada's total GHG emissions be reduced by 17 per cent from 2005 levels by 2020. To achieve this, the Federal government has introduced several initiatives by setting new emissions standards for 2011–2016 model-year vehicles; restrict emissions from heavy-duty vehicles, in alignment with similar regulations being developed in the United States; and phase in regulations to reduce emissions from the generation of electricity from coal, beginning in 2015. In order to curb the GHG emission, new Renewable Fuels Regulations (RFR) was also proposed. These regulations required two per cent renewable content in diesel fuel and heating distillate oil already effective July 1, 2011 with the first compliance period ending on December 31, 2012. In addition, renewable content standards for gasoline were targeted at five percent starting on September 1, 2010.

Based on the RFR, the two per cent renewable mandate would require 500 million litres per year of renewable diesel use (Farm Credit Canada 2012). The federal government is committed to ensuring a minimum renewable content of two per cent in diesel and heating oil by 2012, for a total production of approximately 600 million litres of biodiesel per year). On the other hand, the Canadian renewable content standards targeted at five per cent for gasoline starting on September 1, 2010, represents approximately 2.1 billion litres of ethanol per year according to the Canadian Renewable Fuels Association. This level of renewable content would reduce GHG emissions by more than four million tonnes.

The above mandates of 600 million litres of biodiesel and 2.1 billion litres of ethanol requirement per year will have some impact on the Canadian economy. In this backdrop, the paper aims at estimating the macroeconomic impact of the ethanol and biodiesel sectors in Canada. Furthermore, the study estimates the impact for Canada's trading partners of the proposed biofuel target. As noted, Canada exports 30% of its gross domestic product of which almost 70% of Canadian exports are to the US. On the other hand, more than 60% of Canadian imports are from the US which is about 10% of the total US exports. Apart from USA, some of the Latin American countries are also significant trading partner of Canada.

An input-output model of the Canadian economy is developed to estimate the macroeconomic impact of the ethanol and biodiesel production in Canada. Simulation exercises have been attempted to reach the mandates announced by the Federal government on ethanol and biodiesel use in the transportation sector using modified Leontief model. From these simulation exercises the reduction in GHG emissions has also been measured.

The rectangular input-output model of Canada has been taken for consideration. The input-output transaction matrix of 2009 for Canada which basically describes the flow of commodities from one sector to another has been used while several modifications have also been made to the Use and Make matrix of Canada, 2009.

To consider biofuel sector- ethanol and biodiesel in the 2009 Make and Use table of Canada we have included four new industries – Ethanol, biodiesel, E10 and B5. Eight new commodities have been entered in the list as ethanol, biodiesel, E10, B5, DDG, canola meal (reformed DDG) CO2 and Glycerin. DDG and CO2 are a byproduct of the ethanol sector while canola meal and glycerin comes from biodiesel. The impact matrix is estimated from an input-output model that computes the direct plus indirect impacts on the Canadian economy in 2009. It will also provide us some insights on other sectors of the economy particularly agriculture and agri-food sector. Wheat and corn are used as a feedstock in the ethanol industry, while animal fats, tallow and canola are utilized in the biodiesel industry.

The study estimates the macroeconomic impact-GDP, employment and output on the Canadian economy in 2009, due to the introduction of four new biofuel industries and eight new biofuel and by product commodities. It also explores the detailed impact on industries such as how far the Ethanol, biodiesel, E10 and B5 are linked with rest of the industries in the economy and whether new biofuel commodities have direct impact on agricultural industries or manufacturing or services. It further investigates the impact of the mandates on the Canadian economy to see the additional growth of GDP, employment and output using rectangular Input-output model for Canada.

Preliminary results show that agriculture sector is affected because corn and wheat, canola, fats and oil used as feedstock. Among other industries, mining and manufacturing indus