www.canola-council.org
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Answering Questions about Canola Biodiesel

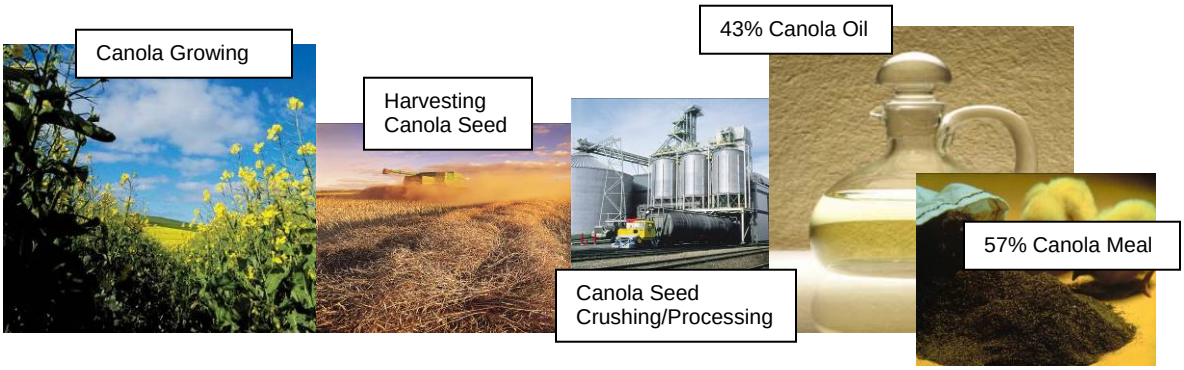
Biofuels? Ethanol? Biodiesel?

These words are popping up regularly as governments around the world move toward replacing a portion of the demand for petroleum, which is a non-renewable resource, with biofuels which can be annually replenished from locally grown crops. There's no doubt that this new industry is good for the economy as new plants are built, jobs are created and farmers' incomes rise. It is expected that in Canada, substituting just 5% of the diesel we use today with domestically produced biodiesel will generate more than $600 million in capital expenditures and contribute more than $.1.1 billion per year additional farm income.[1]

But are there downsides?

Recent media reports have focused on two key areas of concern about biofuels: the use of food crops for fuel and the net environmental benefit of biofuels relative to petroleum.

We'd like to provide our industry's perspective on these issues with the hope that our answers give customers and consumers the confidence that the canola "biodiesel" choice is a good one.

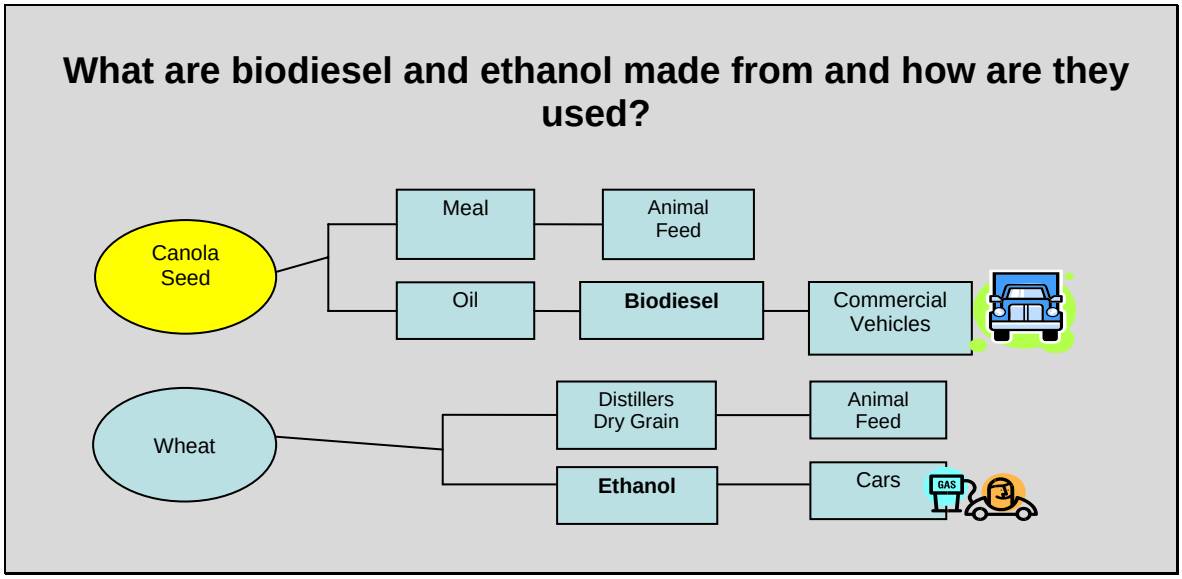


First some background on canola. Canola is an oilseed crop which is grown annually on approximately 13 million acres of Canadian farm land. When the seed is processed it produces 43% oil and 57%

[1] Economic Impact Study for a Canola-based Biodiesel Industry in Canada, July 2006, BBI Biofuels Canada

animal feed, called meal. The oil is further processed into products such as margarine and cooking oil. It can also be made into biodiesel.

Biodiesel shouldn't be confused with ethanol. Although both are "biofuels", biodiesel is produced from oils, such as soy, palm and canola, while ethanol is produced from cereals such as corn and wheat. The flow chart that follows is a simple illustration of the two biofuels "streams"; biodiesel and ethanol, which are used to supplement diesel and ethanol respectively.



* Some commercial vehicles are: trucks, buses, heavy equipment, locomotives and ships.

So, for biodiesel, think canola and think diesel engines for trucks or buses. With the basic questions about what biodiesel is, what it is made from and where it is used answered, we can address questions about the food versus fuel and environmental impact.

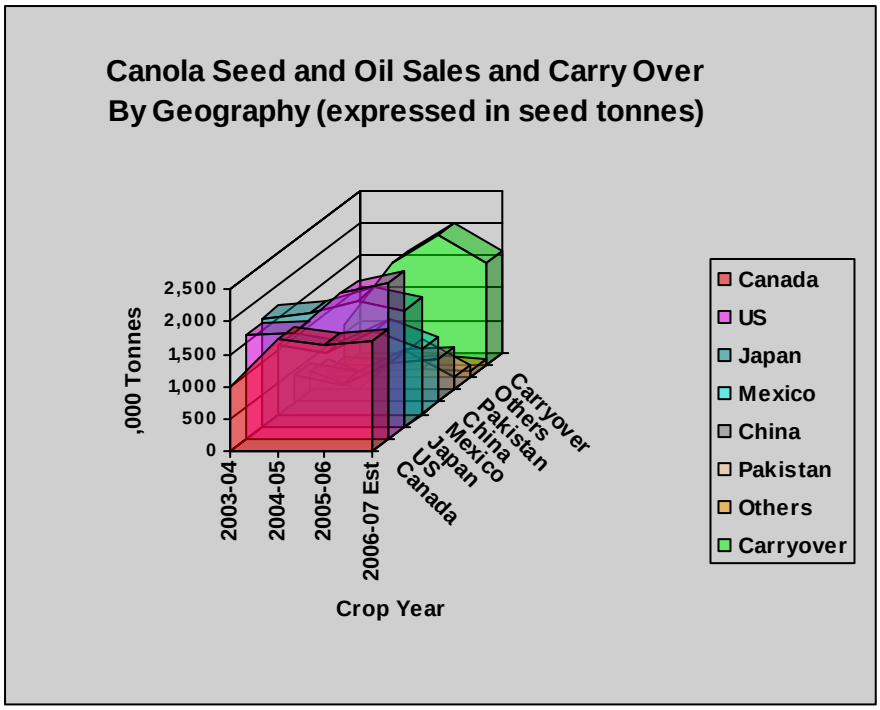
Will using canola oil as a feedstock for biodiesel cause food shortages?

No, there are several reasons why the new demand for canola oil created by biodiesel will not reduce the availability of canola for food use.

1) We have already proven that we grow more than enough canola to fill the mandate. For example, let's consider the amount of canola that would be needed to fill the federal government's recently announced requirement that 2% of the volume of diesel used in Canada be replaced with renewable diesel (biodiesel). To do this, 1.3 million tonnes of canola seed would be required. The "carry over" of canola seed (unsold volume) was 1.59 million tonnes in 2004/05; 2.02 million tonnes in 2005/06 and 1.58 million tonnes for 2006/07.

2) Canola oil is prized as a healthy oil by consumers in developed countries, such as Canada, the United States and Japan and all are capable of absorbing the small increases in food costs that could result from higher grains and oilseed prices. Although there are some developing markets, for example, Mexico and China that also purchase canola, the demographic of the

canola consumer in these countries is very close to those of the developed world meaning that they have sufficient disposable income to purchase higher value oils such as canola.



3) We are going to be able to produce more canola. The numbers of canola acres planted by farmers are increasing, as is the yield of seed that is harvested from those acres. For example, in each of the past two years canola has yielded more than 30 bushels of canola per acre compared to the long term average of 26 bushels per acre. This is due to improved varieties of canola. In addition, canola acres will set a new record in 2007, due to the attractiveness of the financial returns for growing the crop.

4) We are actually going to create more canola meal as a result of increased demand for canola that biodiesel will create. We expect that this increased production will result in lower prices which could actually reduce the cost of feeding dairy cattle, poultry and pork.

It is also worth noting that farmers produce 75% more canola than is required to meet the needs of Canadian consumers so in order to increase use of canola at home, it is necessary to develop a new market outlet, such as renewable fuels.

Looking at the broader global issue of food versus fuel as it relates to biodiesel, it is conceivable that the production of biofuels could actually improve the economic welfare of people living in some of the world's poorest regions. Farmers in Peru, for example are interested in producing canola for domestic biodiesel production. In parts of Africa, the Jatropha plant can be grown to produce oil for biodiesel potentially creating an important new income source for subsistence farmers.

According to a 2003 study prepared by J Wolf et al/Agricultural Systems 76[2], with modern agricultural production practices, 55% of the current global agricultural land area is needed to supply food to 2050, leaving 45% available for non-food uses, i.e. biofuels.

While the purpose of this paper is to address issues specific to canola, much of the controversy surrounding biofuels relates to the consumption of corn for ethanol production. There are several useful sources of information about corn ethanol, including: www.ethanolrfa.org, www.greenfuels.org, www.ncga.com. On these sites you will find information about the impact of ethanol on food supply and price.

Will we harm the environment or the soil by planting more canola for biodiesel?

No, there have been several studies which have shown the advantage of growing canola the year after wheat has been grown on the same land. This "rotation" reduces weeds and disease that can occur if the same type of crop is grown from year to year. With the advent of herbicide-tolerant canola, fewer total pesticides are used and there is more soil microbe diversity.

As well, although canola is a higher user of nitrogen fertilizer than cereal crops[3], it is also a more efficient extractor of nitrogen from the soil, which means there is less nitrogen loss than occurs with cereal crops.

In 2006, the Canola Council of Canada asked a team of experts from the University of British Columbia to undertake an environmental assessment of all aspects of canola biodiesel production[4]. The report, prepared by Paya Solutions Inc. assessed the emissions and environmental impact of canola production. In their opinion, the usage of conservation tillage techniques[5] associated with canola production actually helps to reduce greenhouse gas emissions by sequestering carbon. They estimate that this carbon sequestration effect to be about 1 kg CO2eq[6] for each litre of biodiesel produced from herbicide-tolerant canola.

How much energy does it take to make biodiesel compared to petroleum diesel?

It takes one litre of diesel to produce four litres of diesel made from traditional petroleum sources. The environmental impact study prepared for the Council, by Paya Solutions, determined that all phases of crop production, biodiesel manufacture and transportation, requires 1 litre of diesel to produce 2.5 litres of biodiesel. Therefore, at the most basic level, it takes more energy to produce biodiesel than it does to make diesel. But it does **not** take more energy to make the biodiesel than it provides.

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[2] Exploratory study on the land area required for global food supply and the potential global production of bioenergy, J. Wolf, P.S. Bindraban, J. C. Luitjten, L. M. Vleeshouwers, 2003 Elsevier Science Ltd.

[3] This document takes into account the use of nitrogen and its resulting impact on energy balance and green house gas emissions.

[4] Environmental Assessment Team: Bruce Ainslie (Earth and Ocean Sciences, UBC); Hadi Dowlatabadi (Institute for Resources, Environment and Sustainability, UBC); Naoko Ellis (Dept of Chemical Engineering, UBC); Francis Ries (IRES, UBC); Mahbod Rouhany (Paya Solutions), Hans Schreier (Agriculture and Food Sciences and IRES).

[5] According to Statistics Canada's 2006 farming census the use of non-tillage techniques in Saskatchewan, the largest canola producing province, has risen to 60% from 39% in 2001.

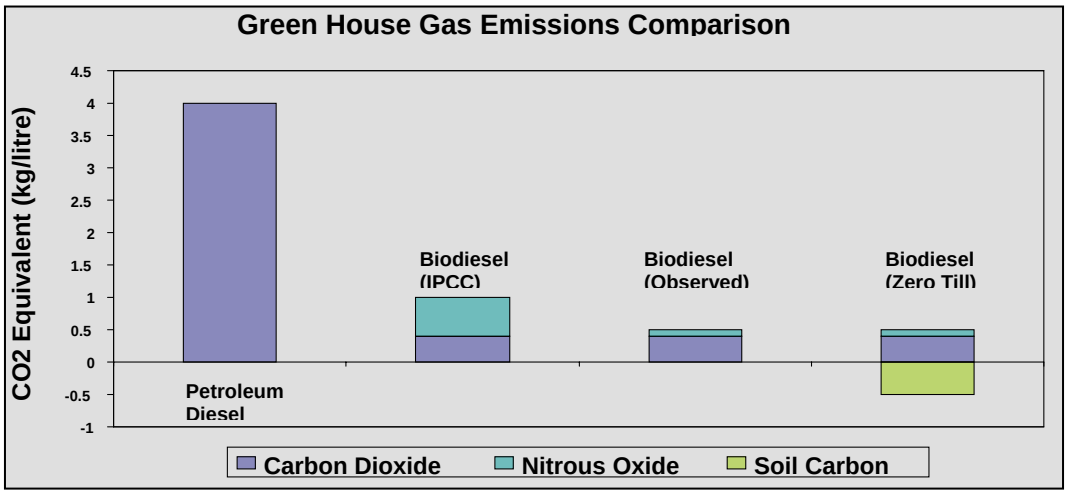
[6] CO2eq stands for CO2 equivalent which is used to measure Green House Gases (i.e. carbon dioxide, nitrous oxide).

There are other factors to consider in assessing the desirability of producing biodiesel. Most importantly, as dependence upon the more energy-intensive oils sands petroleum production grows, the biodiesel/diesel energy balance gap will disappear. Also, biodiesel is a renewable rather than non-renewable resource; relative to petroleum production, income related to biodiesel production is spread amongst many sectors; and no engine modification is required.

In the future, we will also see improvements in canola biodiesel's energy balance and overall Life Cycle Assessment (LCA). As farmers' access to biodiesel grows, their consumption of traditional diesel will fall. New varieties of canola will be developed to increase the yield of canola oil produced per acre and to reduce the volume of fertilizer required to produce the crop.

Will using biodiesel really help to lower Green House Gas Emissions?

Yes and quite substantially, relative to petroleum diesel. A litre of diesel creates 4 kgs of CO2 Equivalent while biodiesel ranges between -.5 and 1 kgs/litre. Although the methods to accurately measure GHG emissions are still continuing to develop, the most reliable estimate is based upon the GHGenius model. The chart below, developed by Dr. Hadi Dowlatabadi at the University of British Columbia depicts a GHG emissions from a range of canola production techniques.



What the chart shows is that there is an 85% to 110% reduction in Green House Gas emissions for biodiesel relative to petroleum diesel.

The difference in nitrous oxide levels for biodiesel under the Intergovernmental Panel on Climate Change[7] calculations, relative to the observed calculations is directly related to the difference in growing conditions in Canada compared to humid, hot growing conditions. Canadian weather conditions limit the production of nitrous oxide.

[7] Intergovernmental Panel on Climate Change (IPCC) is the scientific body coordinated by the World Meteorological Office and the United Nations Environment Program to assess the state of science.

Aren't tail pipe emissions the same for biodiesel as petroleum diesel?

No, burning biodiesel rather than diesel produces substantially lower emissions. Pure biodiesel contains about 10% oxygen by weight and it is this oxygen which leads to a reduction in emissions of hydrocarbons (HC), toxic compounds, carbon monoxide (CO) and particulate matter (PM) when biodiesel blends are burned in diesel engines.

One issue that has been open to question has been the historical assumption that use of biodiesel increases the level of Nox (nitrogen oxide) emissions relative to diesel. In October 2006, the National Renewable Energy Laboratory released its findings[8] that when entire vehicles vs. just diesel engines were tested with a B20 blend, there was no statistically significant difference in NOx emissions between pure diesel and blended product.

This same study found an average reduction in PM and CO emissions of 16% to 17% and HC emission reduction of 12% for vehicles running a 20% biodiesel/80% diesel blend but not equipped with a diesel particle filter.

Biodiesel also reduces emissions of reactive organic gases (ROG) which are considered to be noxious and carcinogenic.

One other benefit of biodiesel is its biodegradability. Each year in Canada we average 3,500 spills of 9 tons per spill. Biodiesel biodegrades in 1-2 weeks which is five times faster than fossil diesel and even in biodiesel/diesel blends it promotes faster degradation.

Will using biodiesel really make any difference given how much petroleum we use?

The government of Canada recently announced that it would regulate a minimum requirement of 2% renewable diesel (biodiesel) use and the province of British Columbia announced a 5% biodiesel mandate which other provinces are likely to follow. If we just use the 2% volume, of 600 million litres, we will be reducing GHG emissions by 3 kg per litre, or 1.8 million tonnes. This is the equivalent of taking 300,000 cars off the road. A 5% inclusion rate is the equivalent of 750,000 cars.

Given that diesel engines do not need to be modified in order to use higher levels of biodiesel, it is conceivable that we could move quickly to 5% biodiesel inclusion and some instances 20% to 100% biodiesel use.

The reality is that by itself, biodiesel won't be the entire solution to reducing our dependence upon petroleum but it is a good place to start.

The Canadian Canola Industry: Innovative. Resilient. Determined to create superior value and a healthier world.

[8] Effects of Biodiesel Blends on Vehicle Emissions, National Renewable Energy Laboratory, October 2006, R. L. McCormick, A. Williams, J. Ireland, M. Brimhall, and R.R. Hayes