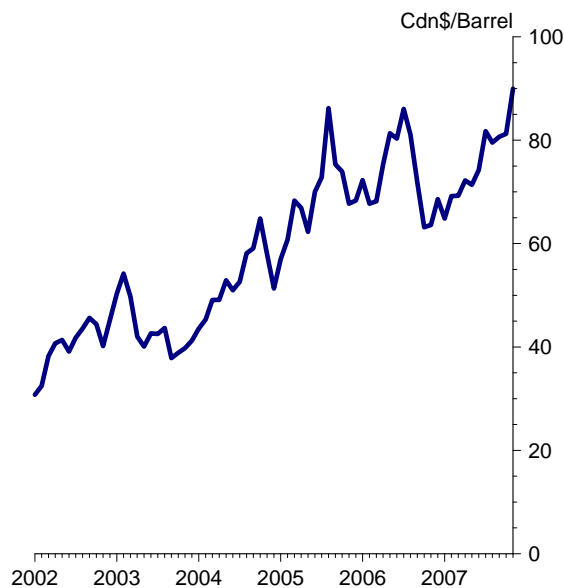


Environmental Statistics ♦ January 2008

It Ain't Easy Being Green: Why Biofuels May Not Be the Answer

The spiralling price of oil has encouraged the pursuit of alternative fuel sources and biofuels made from plant materials, including corn, sugar cane, rapeseed and so on, have become more popular not only as a way to break the dependence on oil, but also as a supposedly environmentally-friendly alternative to using fossil fuels.

The price of oil has been rising steadily over the last several years, making ethanol production more economical



Source: Natural Resources Canada

The theory behind the environmental benefits of biofuels is that the plants from which they are derived absorb the carbon dioxide that is causing global warming, plus they are a renew-

able fuel source and burn cleaner, producing fewer greenhouse gas emissions, compared to fossil fuels. Given the push toward "green" technologies and the apparent environmental benefits, biofuels have gained a great deal of popularity, particularly among governments. For instance, the United States government has targeted a 20% reduction in the use of gasoline in the next ten years through greater use of alternative fuels, such as ethanol. Governments in Canada are also promoting biofuels such as ethanol as an environmental solution. The problem that critics point to is that proponents of biofuels are only looking at a small part of the equation and are not taking into consideration the entire life cycle of the product.

To determine whether or not biofuels are truly a better alternative to gasoline, it is argued that one must examine the "costs" of biofuels from production through consumption. In other words, one has to look at things such as the energy used in growing the crops used to produce the biofuels, the emissions created from the growing process and so forth.

There has been a great deal of research performed regarding the efficiency of biofuels, particularly ethanol, and some of the results have been contradictory. Some studies have found that it actually takes more energy to produce ethanol than is subsequently available as fuel. Even in those studies where a positive energy balance was found, the net gain was at most

about 30% (i.e., 1.3 units of energy produced for every unit expended). The type of plant material used makes a significant difference as well. Unfortunately, one of the least efficient inputs appears to be corn, which is the predominant base for biofuels in North America.

In addition to the doubt about validity of claims that ethanol and other biofuels conserve energy, there is also evidence to suggest that they may actually create more greenhouse gas emissions than they remove. A recent study claims that previous research has underestimated the impacts of fertilizer used in the production of the plant inputs for biofuels.

When the extra [nitrous oxide] emission from biofuel production is calculated in “[carbon dioxide]-equivalent” global warming terms, and compared with the quasi-cooling effect of “saving” emissions of fossil fuel derived [carbon dioxide], the outcome is that the production of commonly used biofuels, such as biodiesel from rapeseed and bioethanol from corn (maize), can contribute as much or more to global warming by [nitrous oxide] emissions than cooling by fossil fuel savings.¹

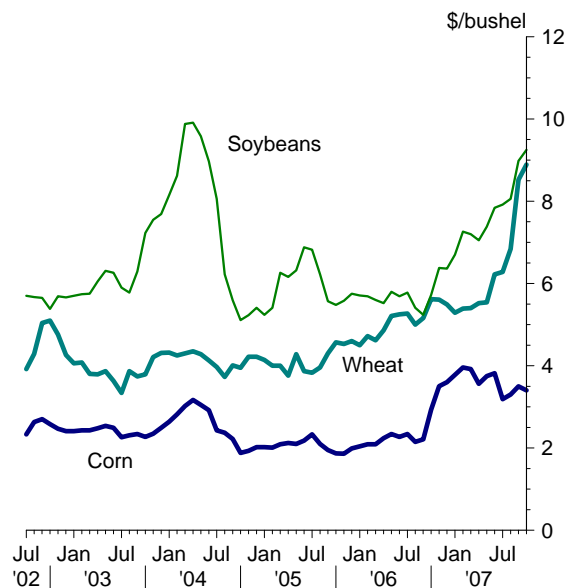
Put more simply, the fertilizers used in production of biofuels contribute as much or more to global warming as the amount saved by not using fossil fuels. The implications of this study are that biofuels are no better than using oil and are quite possibly even more detrimental to the environment. The study does suggest that some plants do offer more favourable conditions for biofuel production, including perennial grasses,

¹ Crutzen, P.J., Mosier, A.R., Smith, K.A. and Winiwarter, W. “N₂O release from agro-biofuel production negates global warming reduction by replacing fossil fuels,” *Atmospheric Chemistry and Physics Discussions*, 7, 11191-11205, 2007.

ligno-cellulosic (i.e., wood) plants and oil palms. However, the cost of producing biofuels from these materials is currently much higher than is the cost of using corn or rapeseed and it is not yet economical to mass produce biofuels using these other materials. That leaves corn as the primary input for biofuel production in North America and, based on the evidence, many critics believe that corn-based ethanol is not an optimal substitute for fossil fuels and may even cause more environmental damage than those other fuels, at least when the corn is grown using current farming methods.

In addition to the disputed environmental effects, there is another serious problem in using corn and other crops as fuels. As the demand for corn for use in making ethanol has risen, so too has the price of corn, which in turn has affected the price of a wide variety of other food products, ranging from foods with corn ingredients, such as cereals and baked goods, to dairy and meat products derived from corn-fed animals. In addition, since corn is becoming a

The increase in corn production has moderated the increase in its price, but substitution of corn for other crops has driven up their prices



Source: US Department of Agriculture

more lucrative crop, many farmers are switching their production away from crops such as soybeans and wheat and growing corn instead, which in turn is driving up the price of those other goods.²

A recent report by Informa Economics disputes the notion that the rise in corn prices is a major factor in food price inflation, suggesting rather that other factors, such as the cost of labour, transport and packaging have a far more significant impact on food prices.³ The report, prepared for the Renewable Fuels Foundation, an organization dedicated to research and planning for the US ethanol industry, looks at the relationship between corn prices and the overall food consumer price index (CPI) over time and finds that the relationship is weak. While this may indeed be true, and certainly the factors driving the price of food are complex, it does not necessarily follow that the recent jump in the price of corn or the shift to growing corn and away from other crops isn't affecting the price of food in general. It is likely that other factors are also affecting food prices, but the push for ethanol made from corn is probably a significant factor in shaping overall food prices.

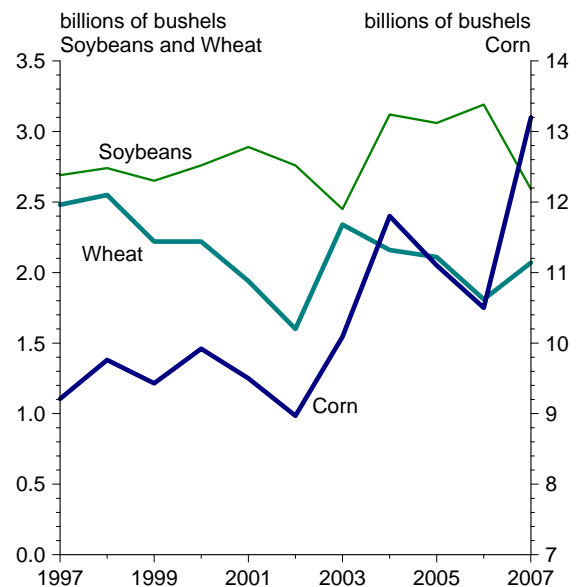
Despite an almost 50% jump in corn production in the United States in just five years from 8.97 billion bushels in 2002 to 13.2 billion bushels in 2007, corn still experienced significant price inflation and the increased demand from the ethanol industry is a likely explanation for the rise in price. The effect on other crops can be seen in the drop in production levels. This is

² The prices in the graph are as follows: corn, no. 2 yellow 30-day Chicago; soybeans, no. 1 yellow, 15-day Chicago; wheat, no. 1 HRW, Kansas City.

³ Informa Economics, "Analysis of Potential Causes of Consumer Food Price Inflation," prepared for The Renewable Fuels Foundation, November 2007.

particularly evident in the slump in soybean production in 2007 at the same time that corn production saw a large jump.

US production of corn has climbed significantly, while production of soybeans and wheat has been flat or falling



Source: US Department of Agriculture

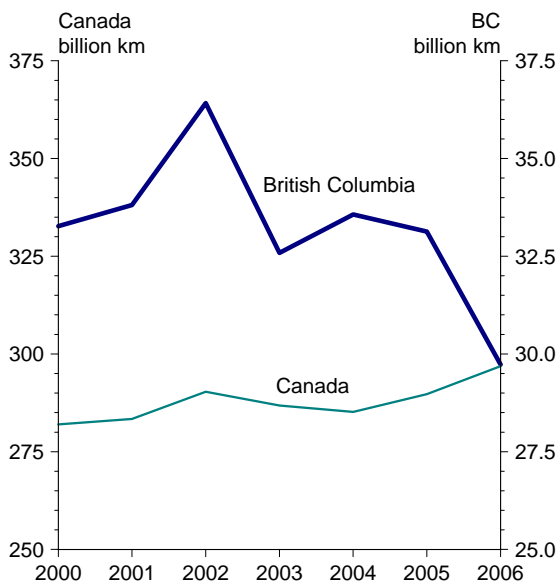
At some point the higher prices for wheat and other crops will likely encourage farmers to shift production away from corn. However, if the demand for corn remains strong, the price will again rise for that good and production will shift back to corn, such that prices will continue to ratchet up in step with energy prices. In the meantime, the prices for other crops may reach a new plateau from which they may not fall anytime soon.

The questions surrounding the environmental benefits of biofuels combined with the inflationary effect on food prices suggest that biofuels may not be the answer to our energy needs. At any rate, perhaps the emphasis should be placed less on finding alternative fuels and more on reducing consumption. The best way

to reduce a vehicle’s impact on the environment is to use it less. Drivers in British Columbia appear to be embracing this concept as vehicle use fell significantly in 2006; however, for Canada as a whole, the number of vehicle kilometres travelled continues to climb.⁴ The decline in BC is despite the fact that the total number of vehicles in the province continues to increase, rising 10% from 2000 to 2006. For Canada, the increase was just over 11% over the same time period.

Vehicle use fell significantly in BC in 2006, but continues to climb for Canada as a whole

Vehicle kilometres for vehicles up to 4.5 tonnes



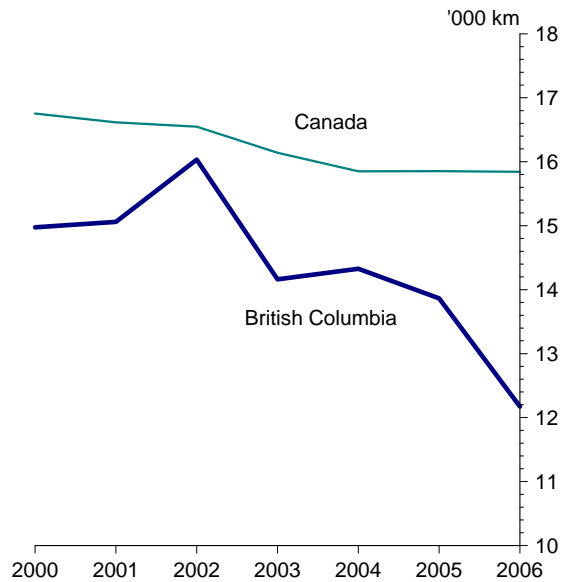
Source: Statistics Canada, Canadian Vehicle Survey

However, on a per vehicle basis, Canadians are driving their cars less, although British Columbians are still well ahead of the pack in terms of reducing average vehicle usage. Canadians reduced their average distance travelled per vehicle by just over 5% between 2000 and 2007, compared to an almost 19% reduction for drivers in British Columbia.

⁴ Note that this is for vehicles up to 4.5 tonnes. Trucks exceeding 4.5 tonnes are excluded from the analysis.

British Columbians drive their cars less than the average Canadian

Vehicle kilometres per vehicle for vehicles up to 4.5 tonnes



Source: Statistics Canada, Canadian Vehicle Survey

Given the uncertain environmental benefits and the impact on the food supply, organizations as diverse as the scientific community and economic organizations such as the OECD have levelled criticism at governments that promote the use of biofuels. Even if it becomes economical to produce biofuels using sources such as grasses and cellulose, which have less of an environmental impact in the production stage, the issue of food or fuel would still be a problem as land would be needed to grow those crops. One solution may be for governments to move away from policies promoting the use of biofuels and toward programs that will help reduce overall vehicle usage, such as better transit or urban growth strategies that promote living closer to work. Based on the scientific evidence, the environmental benefits of those types of policies are almost certain to exceed those related to biofuels.