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RICanada Comments on Canada's Ecofiscal Commission's Report:
Course Correction – It's Time to Rethink Canadian Biofuel Policies

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Introduction

The Ecofiscal Commission has released a report entitled "Course Correction It's Time to Rethink Canadian Biofuel Policies". The report purports to assess the economic and environmental case for biofuel mandates and production subsidies in Canada. Other than some analysis of some of the GHG benefits of the production and use of biofuels, and an inventory of government incentives up to March 2015, the report includes little original research. Instead, the report relies on a selection of already published analysis on biofuels in Canada and around the world. Some of the reports that have been cited no longer even reflect the views of the organizations that originally published them as new evidence in the past decade has changed their views.

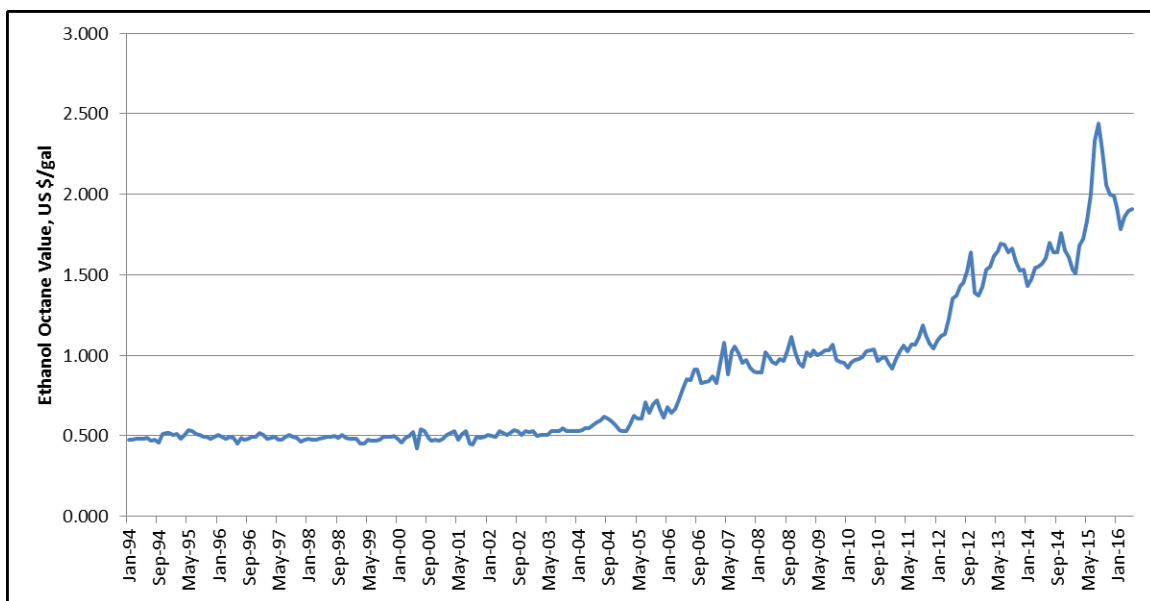
Specific comments on five areas are presented below.

1. Cost Benefit

Biofuels, while they can be blended with gasoline and diesel fuel, do have different properties than fossil fuels. Ethanol and biodiesel both contain some oxygen, which reduces their volumetric energy content, but also promotes better combustion. Ethanol has a higher octane rating than gasoline and biodiesel has a higher cetane rating than diesel fuel. These other properties make the determination of the cost benefit more complex, unfortunately Ecofiscal chose to make the adjustments for the properties if they increased the costs, but did not make the adjustments if they increased the value to the participants in the supply chain or decreased the GHG emissions. The result is a grossly inflated cost for the GHG benefits that are delivered, and is the very foundation of the Ecofiscal recommendations to change the course.



Ethanol is one of the highest octane components available to increase the octane rating of gasoline. Ten percent ethanol in gasoline will increase the octane rating of regular gasoline by about three octane numbers. There are no published prices for octane but it is possible to calculate the value of octane by looking at the price differences between the different grades (octane values) of gasoline. In Canada, the price differences (8 cpl) between regular (87 octane) and premium (91 octane) at the “rack” are artificial and probably over value octane. In the United States, where there is a more viable market, the price difference between 87 regular and 93 octane premium fluctuates significantly depending on supply and demand and is a better representation of the true value of octane.



Source: US DOE EIA

Between 2012 and 2015, the US average value of octane was 1.5 cpl octane number Canadian. This value equates to an extra 47.8 cents per litre of ethanol to a refiner.

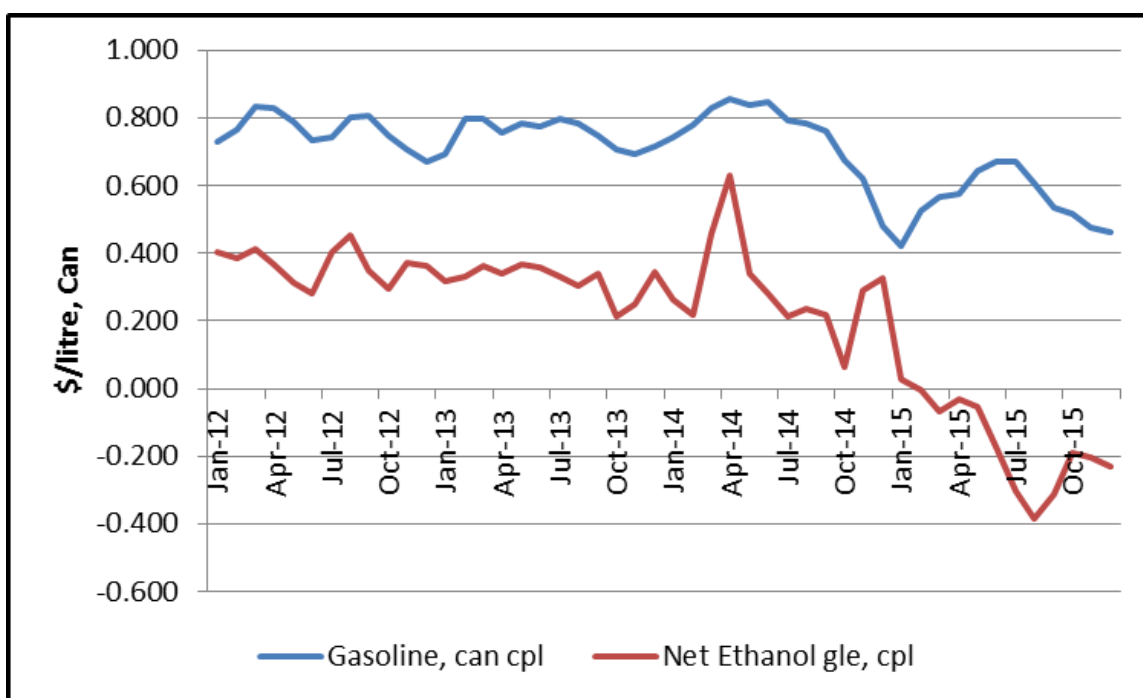
Refiners can achieve this value in different ways. They can continue to make octane in the refinery and sell the high octane products to other refiners, or they can reduce the amount of octane they make, and thereby reduce their operating costs and the GHG emissions.



Refiners in Canada do both, but the most common approach is to reduce the octane that they supply. Refiners produce 84 octane gasoline for blending with ethanol rather than the 87 octane gasoline without ethanol that they used to provide.

Ecofiscal compared the costs of gasoline and ethanol after they adjusted the ethanol price for the lower energy content. They reported that other than a brief period in early 2012, ethanol was more expensive than gasoline. This extra cost was assumed to be born by the consumer and averaged \$317 million per year over the 2012 to 2015 period. This was 68% of the costs that was attributed to ethanol during this period.

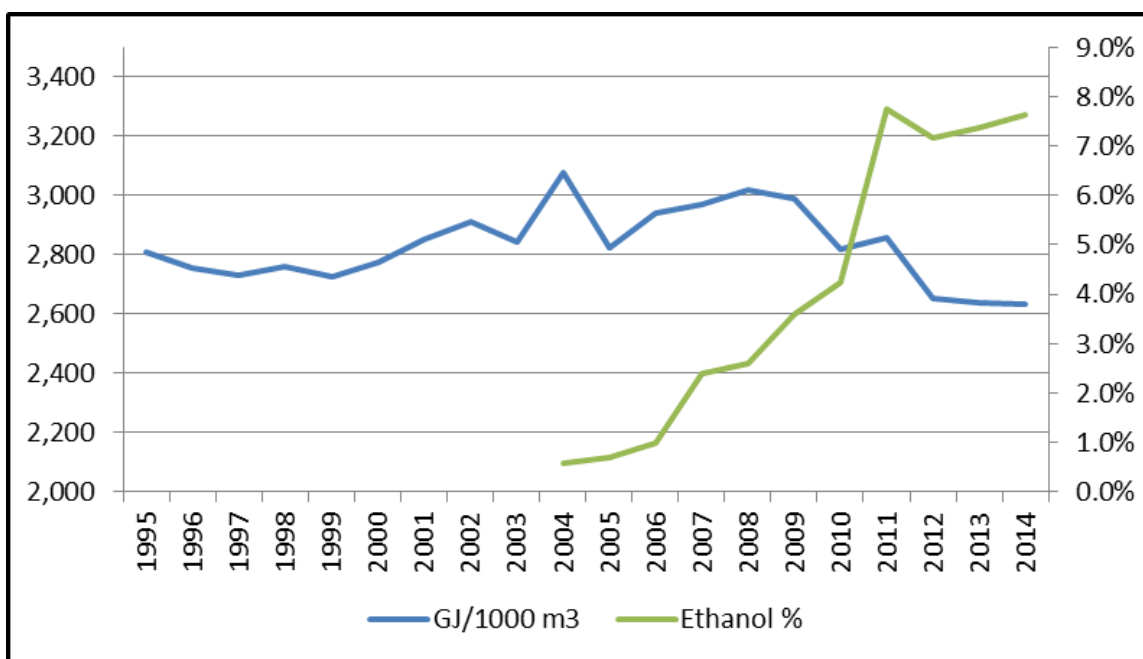
If we account for the value that accrues to the refiner from the octane value, the picture is quite different as shown in the following figure. The ethanol price shown is adjusted for both the octane value and the lower energy content. As the octane value has increased over the past two years the cost of ethanol after octane value has become negative.



Source: Own Calculations based on US EIA data

Through the period that Ecofiscal considered in their analyses, when the octane value of ethanol is considered, ethanol is less expensive than gasoline and the benefit accruing to the refiner was about \$1.4 billion per year using the US data for octane value. After the average of \$152 million in government costs are added the costs are still hugely negative at \$1.25 billion. Ethanol has cost effectiveness of negative \$480/tonne if we accept the Ecofiscal GHG emission estimates. On this basis the program is very successful and Ecofiscal recommendations can't be considered as they are based on a flawed methodology.

The refiners also benefit from lower GHG emissions as a result of not having to produce the extra octane. The emission benefit will vary from refinery to refinery and it is difficult to determine precisely. Statistics Canada does report the total energy consumed in refineries and the total production of refined products. The following figure shows that information along with the average % ethanol in gasoline.



Source: Statistics Canada

Since ethanol began to be added to gasoline, the average energy intensity has been reduced by about 10%. If all of this energy reduction were due to the lower octane as a result of blending the ethanol the GHG emission reduction is very significant. Large reductions in refinery GHG emissions are also found in some peer reviewed literature¹. Croezen found that the GHG emission reductions in the refinery can be larger than the reduction from the production and use of ethanol.

Similar calculations could be undertaken for biodiesel since there is a cetane and lubricity benefit from using biodiesel. The value of these benefits is less transparent than the ethanol and more difficult to quantify but these benefits must be included in any legitimate cost benefit analyses.

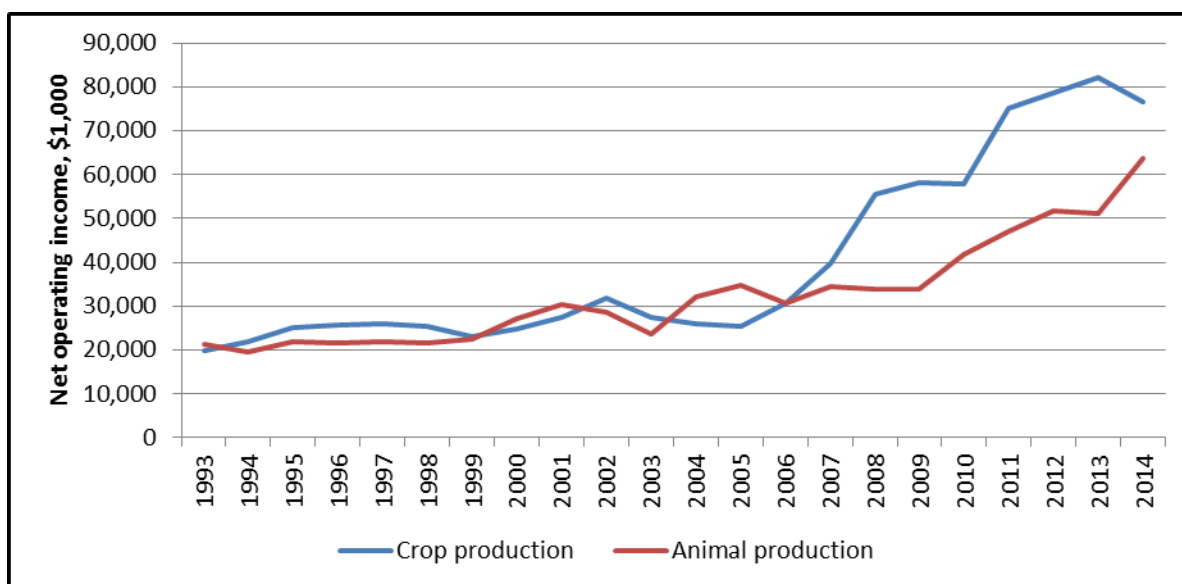
Ecofiscal has gone to great lengths of estimate the GHG emission benefits of the biofuels under different scenarios and using different models. However, they have not questioned the GHG emissions of producing petroleum fuels. The LCA models that are used in North America allow one to undertake an ISO compliant comparative analysis but the user of the model must make some changes to the models to ensure that a proper comparison is undertaken and both the reference case (petroleum) and the study case (biofuels) perform the same service. When this is done, the gasoline and diesel emissions increase compared to the emissions commonly reported for gasoline and diesel fuel, as the service performed by heavy fuel oil and refinery coke is undertaken by natural gas in the study system. This approach was first introduced in work undertaken for Shell by PWC in a study of gas to liquids in 2003².

¹ H. Croezen, B. Kampman, The impact of ethanol and ETBE blending on refinery operations and GHG-emissions, Energy Policy, Volume 37, Issue 12, December 2009, Pages 5226-5238, ISSN 0301-4215, <http://dx.doi.org/10.1016/j.enpol.2009.07.072>

² PriceWaterhouseCoopers. 2003. Shell Middle Distillate Synthesis (SMDS). Update of a Life Cycle Approach to Assess the Environmental Inputs and Outputs, and Associated Environmental Impacts, of Production and Use of Distillates from a Complex Refinery and SMDS Route. May 2003.

2. Impact on Agriculture

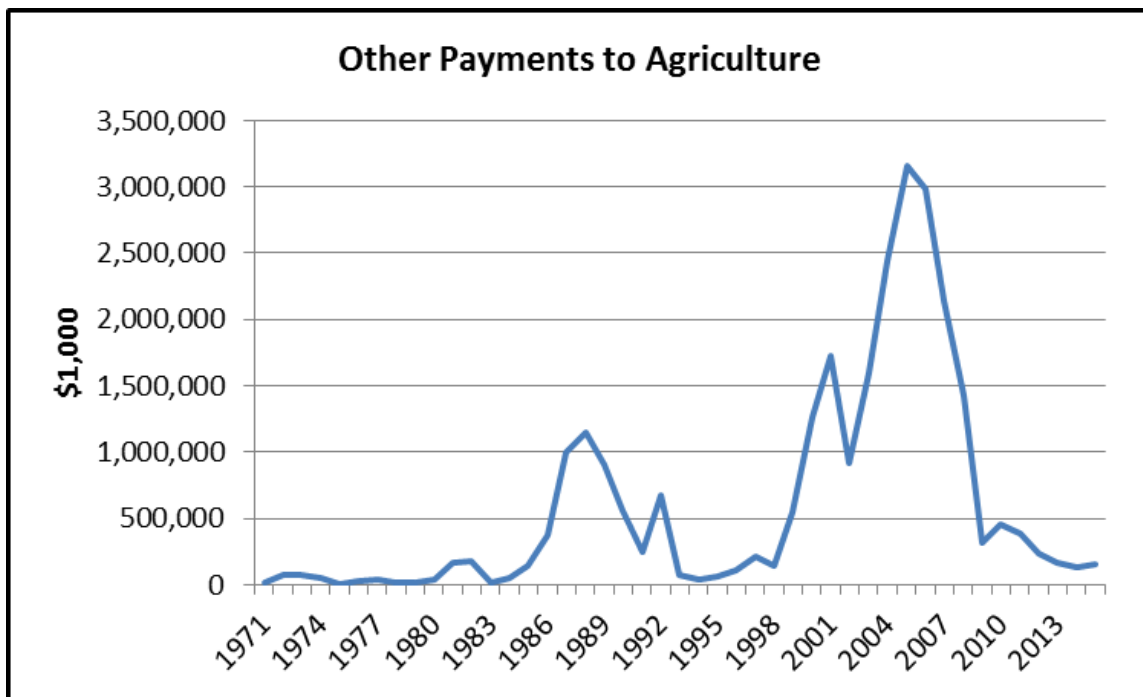
EcoFiscal reports that the rural economic benefits from biofuels have been small and that there have been losses in the livestock sector. However, they provide no real data supplied to support the position, instead they rely on the economic cost benefit analysis that was undertaken by Environment Canada to support the regulation in 2010. Much more data is available now that the industry is established in Canada than was available in 2010. The available data does not support the EcoFiscal conclusion. The following figure shows the net farm income for the grain and the livestock sector in Canada. Farm income has tripled since biofuels became a significant part of the Canadian supply situation.



Source: Statistics Canada

The net farm income began to grow in 2007/2008 after years of stagnation. Significant gains in both the grain and livestock sector have been experienced. At the same time government support for agriculture continues to be at historic lows as shown below.





Source: Statistics Canada

While it is unlikely that all of the gain is due to biofuels it is undisputable that the farm sector has been healthier in the last decade than it was for the previous several decades.

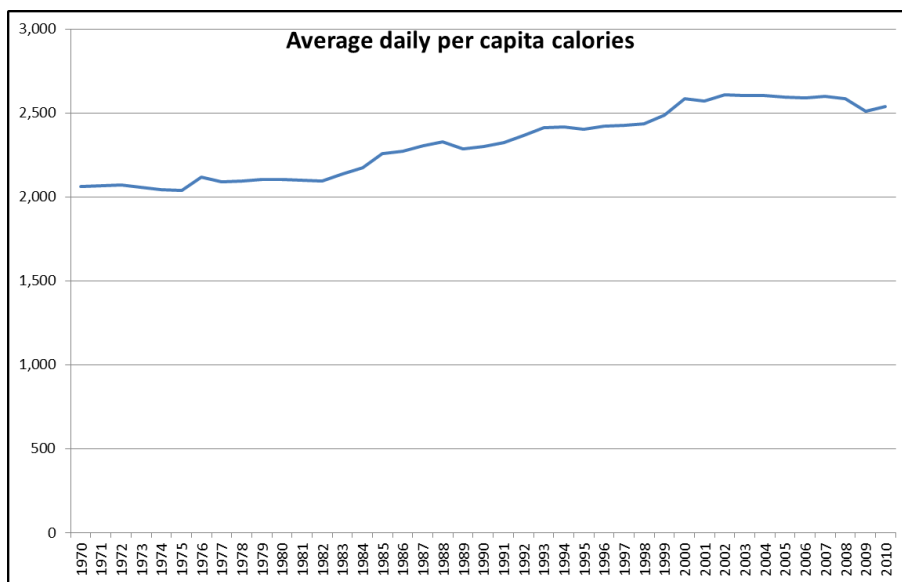


3. Food vs Fuel

The Ecofiscal report raises the issue of food vs. fuel by quoting a 2011 paper by the FAO and other international organizations. Ecofiscal says:

“FAO et al finds that biofuel mandates reduce the amount of total calories available for human consumption, particularly in low-income countries.”

However, that statement does not appear anywhere in the FAO report. It is also not true. The US had a larger increase in biofuel production than any other region and yet per capita food consumption is higher in 2010 than in 1970 before biofuels.



The FAO report does report on food price volatility and notes that the Food Price Index in 2011 had reached the same level as in 2008 and that fears of another food price crisis was underway. That has not happened as shown below.

The food price index is strongly correlated to the oil price index and the food price index is now at pre 2008 level, as is the price of oil.





Rather than misquote a 2011 paper, perhaps Ecofiscal could have looked to see what the FAO currently say about biofuels. In speech delivered by FAO Director-General José Graziano da Silva at the Global Forum for Food and Agriculture in Berlin in 2015 he stated that:

"We need to move from the food versus fuel debate to a food and fuel debate. There is no question: food comes first," he said, adding: "But biofuels should not be simply seen as a threat or as a magical solution. Like anything else, they can do good or bad."

Evidence shows that when developed responsibly, sustainable biofuel production systems can offer an additional source of income for poor farmers.

The FAO Director-General noted that thanks to experience gained in recent years and new biofuel production technologies, "countries today are better positioned to evaluate the opportunities and risks of biofuel production and to use it when it pays off socially, environmentally and economically."

One of the greatest challenges in ensuring that food is available to supply the world's need is that food waste. The FAO estimate that one third of all of the food produced in the world today is wasted before it reaches the consumer.

4. Indirect Land Use Emissions

The Ecofiscal report raises the issue of Indirect Land Use Change (ILUC), a theory that was put forth around 2008. The hypothesis was that if there is an increased feedstock demand there had to be an expansion in agricultural land to supply the additional demand. Clearing this land would create GHG emissions due to the loss of natural vegetation and soil carbon. Various calculations and economic models were developed or adapted to quantify the impact. As time passed and the biofuel demand materialized, we are in position to compare the model projections with what has actually happened. This is part of the scientific method³.

The models all projected an increase in crop land in all countries, and a decrease in forest land and pasture. This has not happened. In the entire developed world, where most biofuel is produced and used, cropland has decreased and pasture and forest have expanded. The increased feedstock demand is being met by crop production intensification (more production from the same land) rather than extensification (new cropland), and an increase in the efficiency of the livestock sector. As a result, the models are being revised and the projected GHG emissions from ILUC are significantly falling. The early projections for ILUC for corn ethanol were more than 100 g/MJ, the latest GTAP model (the model used by California) now has those emissions at about 10 g/MJ. Developers would like to address a number of issues with the model, and that are expected to see further reductions. The model still projects some expansion of land in regions where none is evident, but at least the magnitude of the land use change is getting closer to that what is observed.

³ https://en.wikipedia.org/wiki/Scientific_method

5. Air Pollution

EcoFiscal reports that some emissions from biofuels increase compared to petroleum fuels. That is true but it is almost impossible to get all parameters going in the same direction when large changes are made to systems.

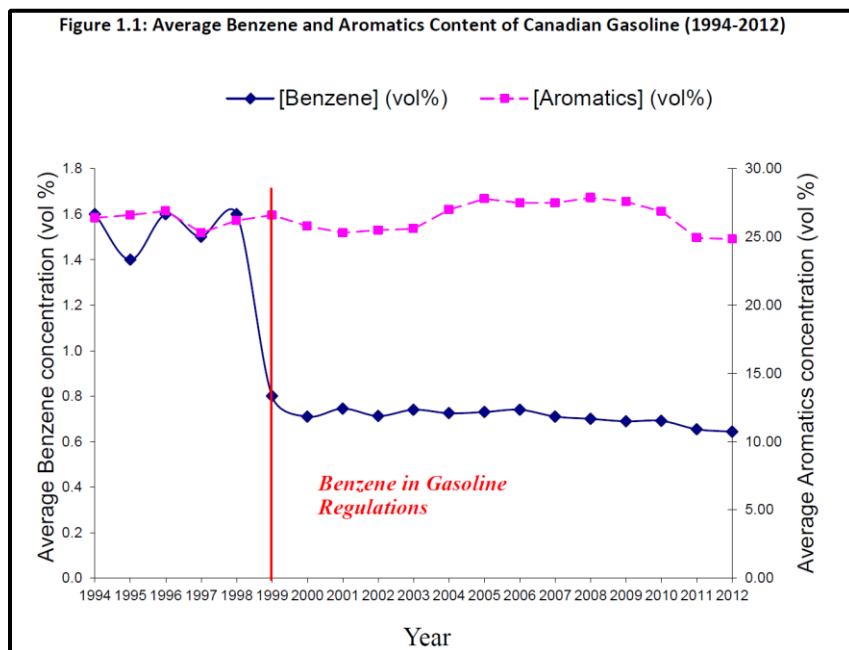
It is important to look at some of the biggest issues with air pollution. It is irrefutable that particulate emissions from diesel engines are reduced with biodiesel. Recent studies indicate that PM can have the following effects on our bodies:

- Can cause lung irritation, leading to increased permeability in lung tissue.
- Aggravates the severity of chronic lung diseases, causing rapid loss of airway function.
- Causes lung tissue inflammation, releasing chemicals that can impact heart function.
- Changes blood chemistry that can result in clots that may lead to heart attacks.
- Can increase susceptibility to viral and bacterial pathogens leading to pneumonia in vulnerable persons who are unable to clear these infections.

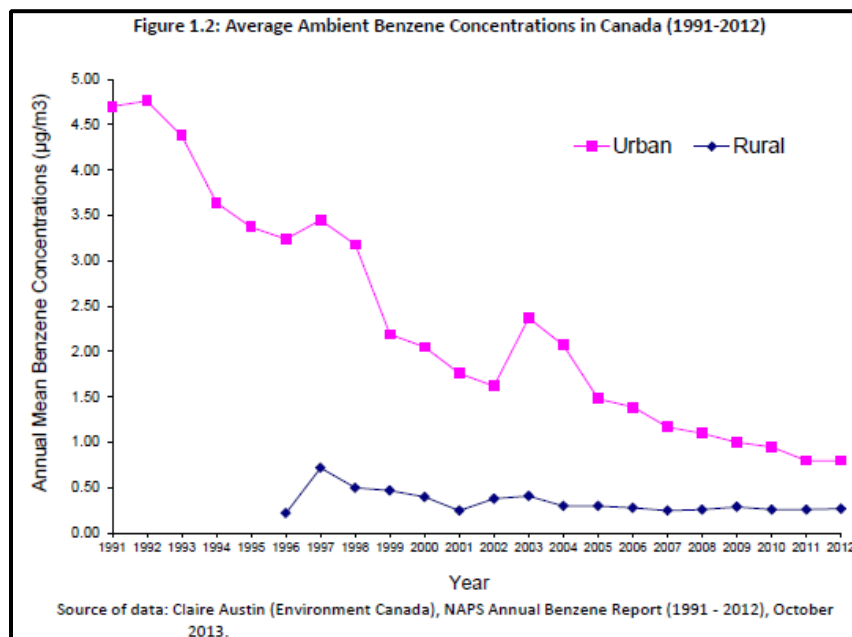
In the case of ethanol there is evidence that since the addition of ethanol to gasoline the aromatic content of gasoline has been reduced and that ambient air benzene levels have declined further. When aromatic compounds are combusted they can produce benzene in the exhaust. The World Health Organization states that benzene is a carcinogen with no safe level.

Environment Canada publishes reports on the aromatic content of gasoline and the ambient air levels of benzene⁴. The following figure is from the latest report. It shows an obvious drop in aromatics in 2011 and 2012 coincident with the implementation of the Federal RFS program. Reduced aromatics would be expected from dilution by the ethanol and by the lower octane level that is in the gasoline before the ethanol is added.

⁴ Benzene in Canadian Gasoline: Effect of the Benzene in Gasoline Regulations, 2010-2012 Triennial Report.
<https://www.ec.gc.ca/energie-energy/43B2171E-0156-4E33-A2F8-E38DCEFD7D34/BiG%202010-2012%20EN%2014%20aug%202014.pdf>



The same report also shows an obvious drop in the trend for benzene levels in the ambient air as shown in the following figure.



Conclusions

The Ecofiscal report makes numerous fundamental errors in their determination of biofuels' cost effectiveness. A properly conducted assessment would reach the opposite conclusion: biofuels are very cost effective at reducing GHG emissions.

Many other Ecofiscal conclusions are not supported by Canadian data. They relied on studies and papers that are old, many written during the commodity boom of 2007 and 2008 when a number of organizations reached conclusions about the cause of the price increases that in retrospect were found to be in error.

There are many other points of contention in the report. In the discussion about government support programs, data for a fiscal year that ended March 2015 is presented as data for the year 2015. This distortion is important since the Federal support for most biofuel producers ended in March 2015, and some Provincial programs ended at the same time. Support programs that Ecofiscal recommends be eliminated ended almost 18 months ago, rather than in 2017 as Ecofiscal reports. While the viability of the Canadian producers without fiscal incentives is questioned in several places in the report, nowhere is it mentioned that more than a year has passed and the only biofuel producer who has stopped operating was not a recipient of any federal support.

In conclusion:

1. RICanada is not advocating for a reinstatement of the expired support programs.
2. The renewable fuel mandates are required to ensure that the GHG emission benefits delivered in a very cost effective manner continue to be part of Canada's actions to reduce GHG emissions. The supply of petroleum products in Canada is an example of "Market Failure". Market failures include externalities, monopoly privileges, information asymmetries and factor immobility. Government action to address market failures is justified to maximize societal benefits.



3. RICanada supports a price on carbon but the programs need to be carefully conceived so that the proper market signals are provided to all participants in the supply chain. This can be a challenge to implement in open economies and with supply chain participants having different objectives.
4. RICanada supports complementary measures that introduce performance standards for all fuels. Canadian produced biofuels have some of the lowest carbon footprints in the world and should benefit from properly implemented systems.

