



Canadian Renewable Fuels Association

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Association Canadienne Des Carburants Renouvelables

# Ethanol

## Key Issues

Fact Sheets/Responses to Key Issues for Canada's Ethanol Industry

**Canadian Renewable Fuels Association**  
**10/14010**

# Table of Contents

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ISSUE: The Economy .....	3
ISSUE: Rural Economic Benefits.....	4
ISSUE: Boosting Farm Income.....	5
ISSUE: Environmental Benefits and Climate Change.....	6
ISSUE: Energy Balance .....	7
ISSUE: Indirect Land Use Change (ILUC) .....	8
ISSUE: Sustainability of Grain-Based Ethanol .....	9
ISSUE: Water Constraints .....	10
ISSUE: Government Programs and Incentives.....	11
ISSUE: Fuel and Food .....	12
ISSUE: Developing World and Hunger .....	14
ISSUE: Cellulosic Ethanol .....	15
ISSUE: Ethanol Imports.....	17
ISSUE: Engine Performance .....	18
ISSUE: E85 and FFVs .....	19

# ISSUE: The Economy

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*What economic impact does ethanol production have?*

Renewable fuels production in Canada is a source of job creation, economic activity and higher revenues that governments, in turn can use to pay for crucial public services.

● **A Jobs and Growth Engine.** A sweeping and independent study conducted by econometric firm Doyletech Corporation, concluded that the renewable fuels sector in Canada has provided – and will continue to provide a sizable boost to jobs and economic growth. Specifically, it found that the renewable fuels sector in Canada was responsible for:

- 14,177 new direct and indirect jobs have been created to support construction of new production facilities and each year, as many as 1,038 new jobs are created to support ongoing operations.
- \$2.949 billion has been generated in economic activity from plant construction and approximately \$1.473 billion in economic activity is generated annually from these same facilities. Nearly all of it in rural Canada. <sup>1</sup>

The report studied 28 ethanol and biodiesel plants across Canada and added that there were major benefits from renewable fuels in “rural re-vitalization, increased oil exports from western Canada, industrial development, and valuable options for re-balancing fuel “mix”.”

● **A Difference-Maker in Smaller Communities.** Ethanol is a welcome boost to direct and indirect job creation as well as spin-off economic growth in smaller communities, often in rural Canada. In a smaller community of thousands or tens of thousands, this kind of activity can make a huge difference in the lives of the communities and the people that live there.

**FACT:** A more concentrated study by Doyletech of Ottawa examined the economic impact of the construction of the newly built Integrated Grain Processors Co-operative Inc. (IGPC) ethanol plant in Aylmer, Ontario. The study found that the project delivered net job creation of 1,152 person-years, a total spending increase within the region and locality of \$276,089,000, a net municipal government benefit of \$7,835,550, a net Provincial government benefit of \$44,172,000 and a net Federal government benefit of \$70,088,000 (this reflects increased tax collections and lower EI costs). <sup>2</sup>

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<sup>1</sup> Doyletech Canada, Total Economic Impact Assessment of Biofuels Plants in Canada, May 2010

<sup>2</sup> Doyletech, 'The Community Economic Impact of the IGPC Renewable Fuels Plant in Aylmer, Ontario', 2009

# ISSUE: Rural Economic Benefits

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*Does ethanol production have a positive impact on rural communities?*

**Yes.** Ethanol brings new jobs, increased economic activity and higher incomes for farm families to rural Canada.

• **Ethanol is good for rural Canada.** It benefits communities and residents by attracting investment, increasing farm incomes, and creating new jobs. The very first independent survey dedicated to measuring the economic impact of Canada's renewable fuels sector was conducted in May 2010 by Ottawa-based Doyletech Corporation. It found:

- 14,177 new direct and indirect jobs have been created to support construction of new production facilities and each year, as many as 1,038 new jobs are created to support ongoing operations.
- \$2.949 billion has been generated in economic activity from plant construction and approximately \$1.473 billion in economic activity is generated annually from these same facilities. **Nearly all of it in rural Canada.** <sup>3</sup>

• **A lone ethanol plant brings significant benefits to a rural community.** The impact of even a single ethanol facility can supercharge a community's local economy.

• **Local suppliers reap the rewards.** The local economic impact is positive and builds outward. From the local farmer who receives a better price for his crops to the new plant, rural shopkeepers, suppliers, and businessmen, all receive a tangible economic boost.

• **Communities benefit from new tax revenues.** New plants mean municipalities have more money to invest in services and infrastructure.

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<sup>3</sup> Doyletech Canada, Total Economic Impact Assessment of Biofuels Plants in Canada, May 2010

# ISSUE: Boosting Farm Income

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*Will ethanol have a positive impact on farm incomes?*

**Yes.** While increases in crop prices are still relatively modest, they do translate into the most sustainable prospect for boosted farm incomes in years.<sup>4</sup>

● **Farmers are getting fair prices.** Farmers are now able to earn more than the cost of production, putting them into a net positive position. In addition to basic fairness, this turn of events will help combat distortions in global agricultural subsidies that hit both our own farmers and those in the developing world very hard. Renewable fuels production also provides a market for damaged or low-grade crops.

**FACT:** The Saskatchewan provincial government has suggested that increasing ethanol use will not only reduce greenhouse gas (GHG) emissions that result from transportation, but also increase farm income for primary producers and create jobs in rural areas, thus contributing to a revitalization of the rural economy.<sup>5</sup>

● **Ethanol is creating new demand and new markets.** Although only about 10% of corn is used for ethanol production in Canada, the rise in demand for renewable fuels creates promising new market options for farmers and the promotion of the domestic, value added agricultural industry. The emergence of \$100+ oil in 2008 and ethanol-friendly policies of the Canadian government suggest that demand for renewable fuels is something farmers can rely on for the future.

**FACT:** “The Government of Canada will invest up to \$1.5 billion over nine years through the ecoENERGY for Biofuels program. The Government of Canada’s Economic Action Plan also dedicates funding to the Clean Energy Fund and the Green Infrastructure Fund to provide additional economic stimulus while promoting a cleaner, more sustainable energy future for Canadians.”<sup>6</sup>

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<sup>4</sup> <http://www40.statcan.ca/l01/cst01/agri01a-eng.htm>

<sup>5</sup> [http://www.uregina.ca/sipp/documents/pdf/PPP48\\_OlfertWeseen\\_online.pdf](http://www.uregina.ca/sipp/documents/pdf/PPP48_OlfertWeseen_online.pdf)

<sup>6</sup> <http://www.nrcan.gc.ca/media/newcom/2009/2009125-eng.php>

# ISSUE: Environmental Benefits and Climate Change

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*Is it true that ethanol generates environmental benefits?*

**Yes.** Ethanol is a practical alternative energy source that can be used in vehicles right now and which both lowers GHG emissions and combats smog. If Canadians are going to succeed in combating climate change, we're going to have to deal head-on with transportation fuels that generate large GHGs emissions from our gas-fuelled cars, trucks and other vehicles. Ethanol is the only practical, immediately available means to lower this impact.

- **Ethanol cuts emissions from our cars.** Ethanol reduces tailpipe carbon monoxide emissions by as much as 30%, toxic content by 13% (mass) and 21% (potency) and tailpipe fine particulate matter emissions by 50%.<sup>7</sup> The 5% RFS alone will generate 4.2Mts fewer emissions – or the equivalent of removing one million cars from our nation's highways.
- **Ethanol lowers GHG's.** A new independent third party analysis of Canadian renewable fuel production conclusively confirms that based on a lifecycle assessment, Canadian produced ethanol and biodiesel significantly reduce greenhouse gas emissions. Ethanol reduces GHGs by 62% and biodiesel by 99%.<sup>8</sup>
- **Ethanol replaces carcinogens in your fuel.** Ethanol actually cuts down cancer-causing emissions such as benzene from our fuel. Ethanol is an oxygenate, a fuel additive that raises the octane level of gasoline, producing a motor fuel that burns more cleanly. For example, a study by the Colorado Division of Public Health and the Environment (DPHE) study showed E10 reduced hydrocarbon pollution like benzene by 16.5%.<sup>9</sup>
- **Ethanol uses less energy.** The most reliable third party studies show that ethanol clearly has a positive energy balance. For one, NRCAN says that corn ethanol has an energy balance that is roughly 40% superior to that of traditional fossil fuels. That rises to as much as 90% when we move from corn to cellulosic ethanol.
- **Ethanol cuts smog.** Studies show that ethanol reduces particulate matter by up to 50%, reduces tailpipe emissions by as much as 30% and reduces toxic emissions by 30%.<sup>10</sup>
- **No harm to water.** A study conducted for the Governors' Ethanol Coalition, "The Fate and Transport of Ethanol-Blended Gasoline in the Environment," concluded that ethanol poses no threat to surface water and ground water.<sup>11</sup>

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<sup>7</sup> Gary Z. Whitten, Smog Reyes, AIR QUALITY AND ETHANOL IN GASOLINE, February 2004

<sup>8</sup> Cheminfo Services Inc., Life Cycle Assessment of Renewable Fuel Production from Canadian Biofuel Plants for 2008-2009, November 25, 2009

<sup>9</sup> Brett Hulsey and Brooke Coleman, "Clearing the Air with Ethanol," Better Environmental Solutions and Renewable Energy Action Project, March 2006

<sup>10</sup> National Corn Growers Association

<sup>11</sup> Governors' Ethanol Coalition

# ISSUE: Energy Balance

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*Isn't it true that ethanol has a negative energy balance?*

**No.** Ethanol produces a decidedly positive energy balance.

- **Studies show an ethanol advantage.** NRCan says that corn ethanol has an energy balance that is roughly 40% superior to that of traditional fossil fuels. That rises to as much as 90% when we move from corn to cellulosic ethanol.
- **New Plants are far more efficient.** Newly built refineries are modernized and energy efficient practices are the standard now. Every ethanol refinery in Canada relies on natural gas and has a positive energy balance.
- **Use a lifecycle analysis.** It's important to examine energy balance based on the entire lifecycle – that is to say all the inputs and outputs involved. NRCan's GHGenius model calculates the energy required to produce renewable fuels. Since GHGenius is a lifecycle model, it takes into account the energy imbedded in the co-products from the production process and adjusts. The energy balances for renewable fuels production in Canada are all positive.
- **Rising Oil Prices Generate Environmental Risks.** As prices soared well above \$100 per barrel in 2008, oil companies began exploring new sources of production that are more remote and require energy intensive extraction methods. This included deep sea drilling of the kind that has caused such controversy in the Gulf of Mexico – as well as the tar sands and arctic exploration. These all carry increased environmental risks, require the expenditure of even greater rates of energy, and contribute much more to greenhouse gas emissions. It is these additional sources of petroleum fuel, which will be displaced by renewable fuels such as ethanol.

# ISSUE: Indirect Land Use Change (ILUC)

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*Does using more renewable fuels in Canada mean that we will need to create more farmland internationally?  
Do energy balances factor in the possibility of indirect land use change?*

**No.** ILUC is a flawed methodology that has been criticized by many independent experts as using false assumptions. Canada has enough current farm land and fallow land to not only produce renewable fuels but also for feed, food, and fibre needs as well.

- **Indirect emissions cannot be measured accurately.** The very nature of indirect emissions means that they cannot be measured or predicted with certainty.
- **ILUC calculations originally done by the EPA and California are based on false assumptions.** The EPA calculations attribute all forest harvesting emissions to indirect land use emissions for agriculture. Even natural deforestation, forest fires, disease, climate damage are also charged to agriculture.
- **Why single out renewable fuels?** The concept of indirect emissions is only being applied renewable fuels and not traditional fossil fuels. GHG reductions in alternative fuels are measured against a percentage difference from gasoline and distillate. However, the indirect emissions from fossil fuels for increased drilling and more intensive extractions procedures are not being taken into account. When assessing GHG emissions, a level playing field of assumptions must be used in order for the analysis to be meaningful. ILUC studies to date have not done this.
- **World agricultural systems are not operating at maximum capacity.** The ILUC argument assumes that the global agricultural system is operating at full capacity. This is untrue. There are many countries where not all agricultural land is fully utilized. For example, in the United States somewhere between 65% and 75% of the agricultural land is used to produce a crop, the rest of the land is in temporary pasture, summer fallowed, or otherwise idle. Similar situations can be found in other countries, India idles as much land each year in summer fallow as 65% of the cropland in Canada.<sup>12</sup> There is significant potential for increasing the production of agricultural crops throughout the world simply by maximizing the capacity of the land that is already in agriculture.

**FACT:** In many countries, the crop production capacity has been growing faster than the traditional uses for the crops and as a result, agricultural producers are looking for new markets. Without new markets, food production may become economically unsustainable. There is ample world capacity to produce fuels, food, and feed in the near future.

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<sup>12</sup> Letter to BC Government in Response to Low Carbon Fuel Requirements Regulation Intentions Paper for Consultation, Don O'Connor on behalf of CRFA, Sept 30, 2009

# ISSUE: Sustainability of Grain-Based Ethanol

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*Isn't it true that corn-based ethanol is an unsustainable business because it drives up its own input costs by generating crop inflation?*

**No.** There is more than ample supply to meet the demand that ethanol production generates – and meeting that supply will get easier, not harder in the years to come.

- **A Grain Surplus.** Canada typically produces just less than 50 million tonnes of grain (wheat, barley, corn, oats, rye) annually, and exports about half of it. Consider: if all Canadian gasoline contained 10% ethanol, about 8 to 9 million tonnes of grain would be required. Even at this level, Canada would remain a major grain exporter.

- **Growing More Grain Per Acre.** Advancements in plant biotechnology have allowed Canadian farmers to grow more corn per arable acre with a softer environmental footprint. The promise of drought-tolerant crops in the next five years will help farmers cope with climate variability.

**FACT:** Biotechnology has increased crop yields significantly. Since new varieties were introduced in 1996, Canadian corn yields, for example, have increased 33 percent from 112.4 bushels per acre to 156 bushels per acre in 2008.<sup>13</sup>

- **Feedstock diversity is the way of the future.** Increasingly, components such as non-recyclable municipal landfill waste, low-input dedicated energy crops on marginal land such as growing switchgrass and camelina, forestry and wood waste, and other forms of waste biomass will form an increasing percentage of our renewable fuel feedstocks.

**FACT:** Researchers are developing biocatalysts – enzymes, yeasts and bacteria that are used to convert any organic matter into cellulosic ethanol – an attractive option since feedstocks such as agricultural by-products, grasses and wood chips are cheap and abundant. Converting these feedstocks into ethanol requires less fossil fuel in the production process and uses the whole plant, rather than just the grain.<sup>14</sup>

- **Farmers are getting fair prices.** Farmers are now able to earn more than the cost of production, putting them into a net positive position. In addition to basic fairness, this turn of events will help combat distortions in global agricultural subsidies that hit both our own farmers and those in the developing world very hard. Renewable fuels production also provides a market for damaged or low-grade crops.

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<sup>13</sup> [http://www.whybiotech.ca/resources/ca\\_biofuels\\_factsheet.pdf](http://www.whybiotech.ca/resources/ca_biofuels_factsheet.pdf)

<sup>14</sup> [http://www.whybiotech.ca/resources/ca\\_biofuels\\_factsheet.pdf](http://www.whybiotech.ca/resources/ca_biofuels_factsheet.pdf)

# ISSUE: Water Constraints

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*Isn't it true that ethanol consumes massive amounts of fresh water?*

**No.** The production of ethanol uses relatively modest amounts of water, particularly compared to other industrial and manufacturing processes.

**Ethanol uses relatively modest amounts of water.** Most ethanol plants use less water in an entire year than is required to produce one Saturday edition newspaper. In addition, most of the water used in an ethanol facility gets recycled and reused.

- How much water is used in the average five-minute shower?
  - 25-50 gallons
- How much water does the average residence use during a year?
  - 107,000 gallons
- It takes 684,000 gallons of water to irrigate one acre of a golf course. The average golf course is 75 acres; that's more than 51 million gallons of water.<sup>15</sup>
- **How much water does it take to refine one barrel of crude oil?**
  - **1,851 gallons**
- **Minnesota ethanol plants report a wide range of water use, with most plants in a range from 3.5 to 6.0 gallons of water consumed per gallon of ethanol produced.**<sup>16</sup>
- **Ethanol recycles water.** Modern ethanol plants have sophisticated water treatment techniques to enable recycling of water to boilers. These treatment techniques also enable the plants to use lower quality water such as sewage treatment plant effluents and even water recycled from animal feedlots.<sup>17</sup> About one third of the water required to make ethanol is reused during the production process. The balance is evaporated or filtered by drainage pumps and reused.<sup>18</sup>
- **Canadian corn wastes nearly no water on irrigation.** When it comes to the production of corn itself, the use of water is also dropping. Notwithstanding that only about 10% of corn is used to produce ethanol, the fact is that the amount of water required for irrigation is miniscule. Almost no corn for forage or grain is irrigated.<sup>19</sup>
- **Using less water through seed technology.** Drought resistant strains of corn will see a 50% reduction in the amount of water needed to grow corn in the near future.<sup>20</sup> Even with moderate drought conditions, new seed technology can even increase the yield<sup>21</sup>

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<sup>15</sup> Illinois Corn Growers Assn. Water Usage

<sup>16</sup> <http://www.agobservatory.org/library.cfm?refid=89449>

<sup>17</sup> Water Use for Ethanol Plants, Institute for Agriculture and Trade Policy, <http://www.agobservatory.org/library.cfm?RefID=89449>

<sup>18</sup> Husky Ethanol Fact Sheet,

[http://www.huskyenergy.com/downloads/abouthusky/publications/factsheets/FS\\_2009\\_Ethanol.pdf](http://www.huskyenergy.com/downloads/abouthusky/publications/factsheets/FS_2009_Ethanol.pdf)

<sup>19</sup> Sustainability of Corn Production, Ontario Corn Producers Association, <http://www.ontariocorn.org/envt/envsust.html>

# ISSUE: Government Programs and Incentives

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*Do governments give the ethanol industry an unfair advantage?*

**No.** Governments support all areas of the energy sector, including oil and electricity, and their current and ongoing support of the ethanol industry will help Canada become a low-cost, world-class producer of this clean-burning, renewable fuel.

- **Canada has made the commitment to renewable fuels.** The national Renewable Fuels Standard (RFS) is the cornerstone of renewable fuels policy in Canada. The RFS, which will see 5% renewable content in gasoline (ethanol) and 2% renewable content in the distillate pool and home heating oil (biodiesel), comes into effect September 1, 2010 and by 2011 respectively, and will result in a demand for 2 billion litres of ethanol and 600 million litres of biodiesel per year. The majority of provinces have established their own Renewable Fuels Standards, either meeting a similar commitment to the national standard or even exceeding it.

- **Canada is investing in renewable fuels.** Over the past decade or so, the government has invested in renewable fuels and advanced green technologies. These programs are meant to establish a self-sufficient industry by aiding in initial research, technology development, demonstration projects, and feedstock availability.

**FACT:** This investment in small compared to other government subsidization of the energy industry in Canada. This has included: more than \$3-billion for Hibernia, \$14-billion for the Darlington nuclear plant and in excess of \$44-billion invested in the oil sands. By comparison, funding for the ethanol industry is relatively small – a payment of no more than \$1.5B in total over many years.

- **Investments in ethanol pale in comparison to fossil fuels.** Worldwide, the oil and gas industries receive an estimated \$500 billion in taxpayer support – notwithstanding the known harmful contributions of greenhouse gas emissions and from oil spills of the sort seen in the Gulf of Mexico.<sup>22</sup>

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<sup>20</sup> Case Study: Invinsa, Syngenta, [http://www.syngenta.com/en/corporate\\_responsibility/pop\\_study\\_invinsa.html](http://www.syngenta.com/en/corporate_responsibility/pop_study_invinsa.html)

<sup>21</sup> Drought Tolerant Corn, Monsanto, <http://www.monsanto.com/droughttolerantcorn/default.asp>

<sup>22</sup> World Wildlife Fund, “Media Background: Fossil Fuels Subsidies”, June 22, 2010

# ISSUE: Fuel and Food

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*Isn't it true that ethanol is consuming crops that are needed for food?*

**No.** Ethanol is made from a variety of sources including crops that are in large surplus beyond what is required to meet both our food and our fuel needs.

- Ethanol is made from industrial corn, which can't be eaten by people
  - Humans can't eat industrial corn; Corn for human consumption is grown on very fertile land with other vegetables like carrots and tomatoes and is picked by hand in order to maintain the cob and husk
  - Corn grown for industrial purposes, including ethanol, is grown on less fertile land and is harvested by huge combines that bury the cobs and stover in the ground
- North America has a large corn surplus
  - Over 14 billion bushels of industrial corn were harvested in North America 2009
  - That harvest was used to generate 12 billion gallons of ethanol and feed livestock. The balance went to provide foreign aid and was exported to manufacture corn syrup
  - There was still a 2 billion bushel surplus in 2009
    - Over 225,000 bushels of surplus corn are produced every hour of every day for the entire year
  - Yields are rising - corn production per acre is becoming greater
    - In the 1980s Canadian farmers produced about 70 bushels of corn per acre
    - In 2009 Canadian farmers averaged 155 bushels per acre
    - In the coming years production is projected to rise to an average of between 200 and 300 bushels per acre
  - Seed technologies will likely double corn yield by 2030 using the same amount of land while using fewer fertilizers and pesticides
- The problem of world hunger is one of distribution, not production
  - UN Secretary General Ban Ki-Moon and Food and Agriculture Director-General Jacques Diouf state that the world produces more than enough food to feed all people<sup>23</sup>
  - Canada is the World Food Programme's fourth largest donor<sup>24</sup>. In 2006, Canada's food aid contributed to meeting the needs of some 87 million vulnerable people in more than 78 countries<sup>25</sup>
- Better corn prices – which benefit farm families - do not significantly increase the cost of groceries
  - Grocery costs are driven much more by production, packaging, transportation and marketing costs than by grain costs<sup>26</sup>

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<sup>23</sup> 2009 United Nations summit on world food security

<sup>23</sup> <http://www.defra.gov.uk/foodfarm/food/pdf/ag-price-annex%205.pdf>

<sup>24</sup> <http://www.wfp.org/about/donors/wfp-donors/2010>

<sup>25</sup> <http://www.acdi-cida.gc.ca/acdi-cida/ACDI-CIDA.nsf/eng/FRA-92513128-MYG>

<sup>26</sup> USDA: Food Marketing System in the U.S.: Price Spreads from Farm to Consumer

- As of 2005 a box of Corn Flakes contained 7 cents worth of corn. Even if prices doubled, the cost of food would not be greatly impacted<sup>27</sup>

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<sup>27</sup> Canadian Federation of Agriculture: Despite Rising Costs, Canadians Still Get Good Value for Money

# ISSUE: Developing World and Hunger

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*Isn't it true that ethanol is consuming corn that is needed to feed the world's hungry?*

**No.** There is plenty of food to feed the world's population. Ethanol has nothing to do with the distribution challenges that cause hunger in the developing world. In fact, renewable fuels are part of the answer, not part of the problem in the developing world. Imported fuels can thus be replaced with locally produced renewable fuels bringing benefits both to small farmers and the economy as a whole.

● **Famine has nothing to do with renewable fuels.** As Nobel Prize winner Dr. Amartya Sen pointed out a decade ago, insufficient food is not the challenge facing the developing world's hungry. It is primarily due to low income and unemployment. These are corrected with strong governing institutions, reliance on open markets, solid infrastructure and sound public policies.<sup>28</sup> UN Secretary General Ban Ki-Moon and Food and Agriculture Director-General Jacques Diouf state that the world produces more than enough food to feed all people.<sup>29</sup> Poverty, harmful economic systems, conflict and climate change are the key underlying causes of hunger.<sup>30</sup>

● **The world supply of grains is growing, not shrinking.** In 2009 North America produced two billion more bushels than required for all uses – food, cattle, and biofuels. Continued improvements in agricultural practices and land management, will allow us to both increase yields and minimize some of the negative effects of agriculture. Some areas that hold much promise include: better pest management, water-conserving irrigation, conservation tillage, and development of new crops through breeding or genetic modification.<sup>31</sup> We grow twice the grain we eat. According to the UN FAO, the world produces at least twice the grains required to feed the planet's population. The challenge is one of public policy – of distribution, infrastructure, corruption and local politics.

● **Biofuels will be a boom to the developing world.** As studies from the IMF, World Bank and FAO (Food and Agriculture Organization of the UN) show, biofuels production represents a boom to farmers in the developing world, promising the arrival of electricity (from co-generation), higher employment and increased crop prices. Just as importantly, rising crop prices should ease global agricultural subsidies that hit farmers in the developing world particularly hard. In fact, the USDA reports that farm subsidies are down by \$6 billion because of ethanol production. The production of renewable fuels will bring direct opportunities to developing countries because their production will create many local jobs in the value chain - from growing raw materials to their manufacture. Furthermore, the local production of biofuels in developing countries will help to decrease the dependency on costly fossil fuel imports.<sup>32</sup>

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<sup>28</sup> A.K. Sen, *Poverty and Famines. An Essay on Entitlement and Deprivation*, Oxford Univ. Press, 1981.

<sup>29</sup> 2009 United Nations summit on world food security

<sup>30</sup> Worldhunger.org – World Hunger Facts - 2009

<sup>31</sup> University of Michigan – Global Change Program – Human Appropriate of the World's Food Supply

<sup>32</sup> European Association for BioIndustries – EuropaBio Fact Sheet

# ISSUE: Cellulosic Ethanol

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*What is cellulosic ethanol?*

Cellulosic ethanol is the future. And the future is now. Plants are being built and the technology is in use. Those who are leading the way on corn ethanol are also leading the way on cellulosic.

How is cellulosic ethanol made? There are two common methods:

- Enzymatic– hydrolysis followed by fermentation of the generated free sugars.
- Gasification – produces synthesis gas that can be converted to ethanol.

• **The future is now.** Cellulosic ethanol is not a technology of the far flung future. It is practical and in operation right now with even more new plants being constructed.

**FACT:** A Canadian Shell Canada service station became the first in the world to sell gasoline blended with renewable fuels made from wheat straw in June of 2009. <sup>33</sup>

**FACT:** Iogen built and operates a demonstration scale facility to convert biomass to cellulosic ethanol using enzyme technology. This facility is located in Ottawa. Iogen is currently assessing a potential location for a commercial scale cellulosic ethanol plant. <sup>34</sup>

**FACT:** Using wood chips as feedstock, SunOpta's technology is projected to decrease process water consumption by up to 75% compared to producing corn ethanol while retaining all of the life-cycle carbon benefits inherent to cellulosic ethanol. <sup>35</sup>

**FACT: Lignol (TSX-V: LEC)** is a Canadian company undertaking the development of bio-refining technologies for the production of fuel-grade ethanol and other biochemical co-products from non-food cellulosic biomass feedstocks. <sup>36</sup>

**FACT: Enerkem Inc.,** is a leading advanced renewable fuels and biochemicals technology company. Enerkem will become the first producer of liquid fuels and green chemicals to commercially use renewable, non-food, negative-cost feedstock. <sup>37</sup> Enerkem's Westbury plant will be the world's first ethanol plant to use negative-cost and unconventional materials - treated wood from used electricity poles. <sup>38</sup>

• **Renewable fuel feedstocks are evolving.** Corn ethanol is the foundation and we're building upon it with cellulosic technologies. Increasingly, we will be able to use non-recyclable municipal landfill waste, low-input

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<sup>33</sup> Shell / Iogen release – Ottawa – June 2009

<sup>34</sup> Iogen Corporation [www.iogen.ca](http://www.iogen.ca)

<sup>35</sup> SunOpta [www.sunopta.com](http://www.sunopta.com)

<sup>36</sup> Lignol Biofuel [www.lignol.ca](http://www.lignol.ca)

<sup>37</sup> Enerkem Inc. [www.enerkem.com](http://www.enerkem.com)

<sup>38</sup> Enerkem News Prelease – Jan 2009

dedicated energy crops grown on marginal land such as switchgrass, forestry and wood waste, and other forms of waste biomass. That's the future of ethanol and it will ease pressure on corn consumption.

- **Cellulose ethanol will help diversify our energy supply.** Making ethanol from a wider variety of feedstocks means greater certainty for ethanol supply, lower costs and reduced reliance on traditional fossil fuels.

**FACT:** Cellulose is the main component of plant cell walls – making it the most common organic compound on Earth. It is estimated that Canada could produce more than 5 billion litres of cellulosic ethanol per year based solely on the recoverable fraction of crop residues, one of many sources of cellulosic feedstock.<sup>39</sup> The United States alone is capable of producing a sustainable supply of in excess of 1 billion tons of biomass, which would be sufficient to take the place of 30% of the country's petroleum consumption.<sup>40</sup>

- **The corn ethanol producers of today are the cellulosic ethanol producers of tomorrow.** Corn-based processing plants will be adapted into bio-refineries capable of accepting and processing wide varieties of biomass.

**FACT: GreenField and Enerkem** are presently collaborating on Canada's first commercially viable ethanol gasification plant. 100,000 dry tonnes of municipal sorted waste from the city of Edmonton will be turned into 40 million litres of renewable fuels each year.

- **Cellulosic ethanol has even more environmental benefits.** Cellulosic ethanol reduces greenhouse gas emissions by more than 80% and as much as 100%, over gasoline and will reduce our reliance on fossil fuels.<sup>41</sup>

**FACT:** When fossil fuels are consumed, carbon sequestered from the global carbon cycle for millions of years is released into the atmosphere, where it accumulates. Renewable fuel consumption can release considerably less CO<sub>2</sub>, depending on how it is produced. The photosynthetic production of new generations of biomass takes up the CO<sub>2</sub> released from ethanol production and use. Life-cycle analysis at Argonne National Laboratory shows CO<sub>2</sub> emissions from cellulosic ethanol to be 85% lower than those from gasoline.<sup>42</sup>

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<sup>39</sup> Champagne, Queen's University, Feasibility of producing bio-ethanol from waste residues: A Canadian perspective, 2007

<sup>40</sup> US Department of Energy and US Department of Agriculture

[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6VDX-4M1D05W-4&\\_user=10&\\_coverDate=05%2F31%2F2007&\\_rdoc=1&\\_fmt=high&\\_orig=search&\\_sort=d&\\_docanchor=&view=c&\\_searchStrId=1222964974&\\_rerunOrigin=scholar.google&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=8d04c8dbc5e0bb83886ddde3ecc8c87c](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDX-4M1D05W-4&_user=10&_coverDate=05%2F31%2F2007&_rdoc=1&_fmt=high&_orig=search&_sort=d&_docanchor=&view=c&_searchStrId=1222964974&_rerunOrigin=scholar.google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=8d04c8dbc5e0bb83886ddde3ecc8c87c)

<sup>41</sup> <sup>41</sup> Cheminfo Services Inc., 'Life Cycle Assessment of Renewable Fuel Production from Canadian Biofuel Plants for 2008-2009', 2009; US Department of Energy

<sup>42</sup> Ethanol: The Complete Lifecycle Picture – Argonne National Laboratory, University of Chicago

# ISSUE: Ethanol Imports

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*Couldn't we just import ethanol into Canada instead of building our own industry?*

**No.** Relying on imports would deprive Canada of the economic and environmental benefits of building a world-class industry here at home. Moreover, the supply that does exist in other countries is often earmarked for domestic use.

- **Canadians benefit from made-in-Canada ethanol.** Good jobs are created. Farm incomes rise. Rural communities gain much-needed investment. And our national energy supply is diversified in an era of international instability in energy markets. By relying on imports, Canada would be forfeiting the benefits that accrue to farmers, businesses and rural communities in the form of higher farm incomes, more and better jobs and infrastructure investment.

- **Foreign sources of ethanol are not reliable.** Brazil, for instance, is a leader in ethanol production – but its domestic market consumes almost all the supply.

- **To prosper in the future, Canada needs to be at the forefront of new technologies and markets.** Ethanol is a growing industry in which we can be a leader. Canada should grow the feedstock and do the value-added processing that creates renewable fuels, such as ethanol.

# ISSUE: Engine Performance

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*Will using ethanol-blended gasoline negatively affect the performance of my vehicle's engine?*

**No.** The opposite is true, in fact. Ethanol is a high-performance, octane boosting fuel that is used to achieve the highest levels of automobile performance while generating environmental benefits and improving engine performance.

- **Engines perform better with ethanol.** That's why high-performance vehicles like Indy race cars run on clean, efficient ethanol. IndyCar Series, which is recognized for its technical leadership in automobile racing, is now the motorsports leader in renewable and environmentally responsible fuel produced in America. The IndyCar Series' groundbreaking use of 100 percent fuel-grade ethanol in its Honda Indy V-8 engines will have an impact on motorists' fuel choices for years. Ethanol, which can be manufactured from a variety of home-grown grains, is biodegradable, renewable and ecologically friendly. The long-term message is clear: If 650-horsepower IndyCar Series cars that cover the length of a football field in 1 second can run safely and effectively on 100 percent fuel-grade ethanol, so can your vehicle (either 90 percent gasoline/10 percent ethanol blend or an E85 vehicle) with reduced emissions as an add-on benefit.<sup>43</sup>

**FACT:** Although 10 per cent ethanol-blended gasoline has about 3 percent lower energy content than pure gasoline, it is an oxygenated fuel that has the ability to improve combustion efficiency in many vehicles. For most vehicles, this increased efficiency helps to offset the slightly lower energy content in the ethanol-blended gasoline.<sup>44</sup>

**FACT:** Fuel economy is a non-issue. Using a 10 percent ethanol blend (E-10) does not significantly affect a vehicle's fuel economy. Overall, use of E-10 increases fuel consumption by an average of 2 percent compared with pure gasoline while driving at 120 km/h rather than 100 km/h increases fuel consumption by an average of 20 percent.

- **There is no higher-octane, better-performing fuel on the market.** And all vehicles produced since 1982 can run on ethanol blends of up to 10%. Newer Flex-Fuel Vehicles can use blends of up to 85%
- **Ethanol helps keep your engine cleaner.** Because it's a solvent, build-up is reduced in injectors and other components.
- **Unmatched performance.** Ethanol is the highest performance fuel on the market, with an octane rating as high as 105. In fact, the Indy Racing League – home of the Indianapolis 500 - began using 100% ethanol instead of methanol as its official race fuel due to its performance and clean burning attributes.<sup>45</sup>

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<sup>43</sup> IndyCar.com

<sup>44</sup> Ministry of the Environment - Ontario

<sup>45</sup> <http://www.indycar.com/tech/ethanol.php>

# ISSUE: E85 and FFVs

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*Are Flex Fuel Vehicles (FFVs) a practical possibility?*

Yes. Flex fuel vehicles can run on any combination of gasoline and up to 85% ethanol, commonly known as E85. More and more flex fuel vehicles are on the road every day, reducing the number of GHGs, smog-causing emissions in our atmosphere and air we breathe.

- **E85 is a fuel of the future – and it’s available now.** It’s a fuel-ethanol mix that typically contains 85% ethanol, far in excess of the 10% ethanol found in most of today’s ethanol-enhanced gasoline.
- **Higher-blend ethanol fuels will take time to come online.** There’s no question that E85 is practical and possible. But it will take some time before a blend this high becomes commonplace at the gas pump. However, the more FFVs on the road, the higher the demand for E85 and the pumps will surely follow.
- **FFVs are available now.** There are about 50 2010 Flex fuel Vehicles models available in North America today.<sup>46</sup> GM is the leading producer of E85 Flex Fuel vehicles, with 18 different models available in 2009. Their goal is to have 50 percent of the annual vehicle production be E85 capable by 2012.<sup>47</sup>
- **It burns clean.** The higher ethanol content makes E85 the cleanest burning fuel available today, with fewer greenhouse-gases and smog-causing emissions, including benzene, toluene, xylene and other harmful emissions.<sup>48</sup>

**FACT:** FFVs that run on E85 have about a 10-15% drop in fuel efficiency but is usually compensated by the manufacturers with a larger fuel tank.<sup>49</sup> Research indicates Ford FFVs experience a 5% horsepower gain on E85. The range of any particular vehicle is dependent on the size of the fuel tank and driving habits. Current Ford Taurus FFVs have a 65-litre fuel tank and will normally travel 550 kilometers between refueling.<sup>50</sup>

- **New ethanol engines speak to a world of new benefits.** For example, Ricardo Inc and Growth Energy in the US are collaborating on the first vehicle-based demonstration of Ricardo's Ethanol Boosted Direct Injection (EBDI) engine technology. This engine is cost effective, and produces optimized power and efficiency from any blend of ethanol. They are confident this practical demonstration will prove up to 30% increased fuel economy and CO2 improvement compared with the current generation of E85 engines, with inherently low emissions and uncompromised performance.<sup>51</sup>

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<sup>46</sup> Jeff Wyaski, List of 2010 Flex-Fuel Vehicles, autotropolis.com, November 6, 2009

<sup>47</sup> [www.gm.com](http://www.gm.com)

<sup>48</sup> [Health Canada \(http://www.healthcanada.gc.ca/ewh-semt/air/out-ext/effe/ethanol/index-eng.php\)](http://www.healthcanada.gc.ca/ewh-semt/air/out-ext/effe/ethanol/index-eng.php)

<sup>49</sup> Office of Energy Efficiency, Government of Canada

[www.oee.nrcan.gc.ca/transportation/fuels/ethanol/safety.cfm?attr=16](http://www.oee.nrcan.gc.ca/transportation/fuels/ethanol/safety.cfm?attr=16)

<sup>50</sup> Ford Motor Company. E85.

<sup>51</sup> Ricardo Inc. <http://www.ricardo.com/en-gb/News--Media/Press-releases/News-releases1/2010/Ricardo-and-Growth-Energy-to-demonstrate-benefits-of-extreme-ethanol-optimization/>