Ethanol – the local fuel....green and clean

August 24, 2010

www.greenfieldethanol.com
In the development of an Energy Strategy for Canada, it is important to distinguish between Electricity and Transportation.
Considering fuels for a balanced Energy Strategy must address the impact on:

- Health
- Environment
- Economy
- Security
Why do we need an alternative to gasoline?

- 30% of Canada’s Greenhouse Gas emissions come from transportation (12% from passenger vehicles)
- Air pollution - CO, CO₂, smog, particulates, NOx and SOx from tailpipe emissions & carcinogenic aromatics used for octane. These are all health concerns especially for vulnerable populations – cancer, asthma symptoms and other respiratory related illnesses.
- Finding and producing the volume of oil that is going to be required on our present trajectory is problematic, risky and potentially dirty.
- 80% of the oil and gasoline east of Manitoba is imported. North America cannot continue to send $800 million per day overseas and out of our countries. This revenue also gives immense power to others including our enemies.
- Issues of Health, the Environment, the Economy and Security.
What are the alternatives for gasoline?

A silver bullet will not solve the issues from our fossil fuel use in passenger vehicles. A collection of solutions will be required.

- Cleaner gasolines and extraction
- Renewable fuels – ethanol and biodiesel
- Engine technologies
- Electric Cars – solar, wind, hydro and nuclear
- Conservation
What is ethanol? – You may know it as vodka but it is also...

- A renewable transportation fuel, traditionally made by fermenting corn, wheat, or sugar cane (often referred to as first generation)
- Typically blended with gasoline at 10% (E10) and can be used at E15 or sometimes higher in car engines without any modification. Can be blended at higher levels (i.e. E85) with minor vehicle modifications.
- Cellulosic ethanol can be made from agricultural residues and biomass such as corn cobs, wheat straw, corn stover, wood, energy crops and even municipal waste (second generation).
Ethanol’s benefits and qualities (details to follow)

1. Green House Gas (GHG) reduction & lower environmental impact
2. Pollution reduction & clean octane enhancement
3. Energy Security
4. Farmer prosperity
5. Jobs, economic activity, and economic benefit to the country
Environmental Benefits

**GHG reduction**

- Canada’s Ethanol policy will result in GHG reductions of about 4.2 mega tonnes per year
- equivalent to removing one million cars off the road
- The Journal of Industrial Ecology published this recent peer reviewed study by the University of Nebraska in 2009 reporting that GHG emissions are reduced by up to 48-59% when using ethanol transportation fuel. *

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*Journal of Industrial Ecology, Yale, University, Liska 2009 Report*
A new study …

* a better than 60% GHG reduction with ethanol from Canadian ethanol refineries

In 2009, Cheminfo Services analyzed and sampled of eight ethanol plants in Canada (including GreenField’s Varennes, QC and Johnstown, ON operations). The analysis was conducted using the most recent version of the Natural Resources Canada GHGenius lifecycle assessment model for transportation fuels.

The analysis of the Canadian ethanol plants found:

“On an energy basis, the results show that the reduction in fuelcycle GHG emissions from one megajoule (MJ) of ethanol (when used in an E10 fuel blend) is 62% of the fuelcycle GHG emissions from one megajoule (MJ) of gasoline.”
Pollution Reduction – ethanol reduces every single tailpipe emission

Ethanol has improved urban air quality

• Compared to gasoline, ethanol reduces every single tailpipe emission (CO; CO₂; smog; particulates; NOx and SOx) because ethanol contains 35% oxygen and results in a higher temperature burn.*

• Medical authorities assert that tail pipe pollutants irritate your airways and especially your lungs. These pollutants trigger reactions in individuals with asthma; and aggravate systems in individuals with respiratory, cardiovascular, heart and lung conditions and other conditions.

• Ethanol reduces tailpipe fine particulate matter emissions by 50%**

• In 11 summer days, Ontario corn produces enough oxygen for the annual respiratory needs of the whole province of Ontario.***

*** Grain Farmers of Ontario 2010
Health Benefits

**Ethanol provides octane without carcinogens**

The octane of gasoline needs to be increased in order to produce the power required from today’s smaller and lighter engines.

- 20 years ago – octane was achieved by adding lead. It was banned.
- Octane was then achieved by adding benzene, toluene or zylene. Known carcinogens.

**Ethanol is not harmful nor a carcinogen. The octane of ethanol is 118. When added to gasoline, ethanol produces 87, 89, 91 and 94 octane blends.**

GreenField’s ethanol race car won the Formula Ford race in Montreal, Quebec, August 2009.
Canadian farmers have prospered from ethanol policy

- Almost $400 million dollars of corn will be purchased in Ontario alone this year to make ethanol.
  - Ethanol created a new market for 83 million bushels of corn.
  - Ethanol positively impacts at least 20,000 farms in Canada
    - Higher farm gate income due to local basis value for corn.
    - This additional income further stimulates farm investment and economic activity.
  - Farmers now have direct market access to the industrial customer through programs like GreenField’s ‘Buy Direct’ program, which offer a variety of risk management tools for the grower.
**Economic Benefits**

**Jobs, capital investments and economic activity**

**INVESTMENTS FROM BUILDING CANADA’S ETHANOL INDUSTRY**

Private and public investments of $2.326 billion constructed Canada’s 28 renewable fuel plants. The total net economic activity derived from this construction was $2.949 billion, including:

- During the construction of the current renewable fuel plants in Canada, 14,177 jobs were created.

**ANNUAL CONTRIBUTION OF CANADA’S ETHANOL INDUSTRY**

Ethanol generates gross annual economic benefits of $2.139 billion to the Canadian economy including:

- 1,038 jobs support the ethanol industry.
- Expanded oil exports as a result of Canadian ethanol production are an annual benefit of $540 million.

Total Economic Impact Assessment of Biofuels Plants in Canada; Doytech 2010
Economic Benefits
An example

**GreenField’s Johnstown ethanol refinery creating economic activity**

In 2010, Doyletech* conducted an economic impact assessment on a GreenField’s Ethanol refinery in Johnstown with a capacity to produce 200 million litres per year. The annual economic results are as follows:

- A total of 69 person-years of employment is created each year from a refinery.
- There is an annual increase in net economic spending in the local community of **$162 million** coming from the plant’s operations. This is over and above the net revenues, after costs, obtained by the plant for its ethanol and DDG production and includes the increase in local corn basis.

*Doyletech is a recognized leader in economic impact assessment across industries and programs.*
Biofuels generate research jobs in Canada

- Canada’s new ethanol facilities have become incubators for innovation and biotechnology R&D like GreenField’s Centre of Excellence.
- GreenField works with biotech developers like Monsanto and Dupont who have researchers dedicated to the biofuels industry (corn seeds); as well as yeast and enzyme manufactures.
- Biofuels are generating activity in Universities. GreenField is working with the following 5 institutions.
  - University of Guelph
    - The NSERC Bioconversion Network
    - Bioproducts Discovery & Development Centre
  - University of Western & Lambton College
    - Bio industrial Innovation Center
  - University of Toronto & Waterloo University
    - Engineers looking at engines fueled by ethanol
Economic Benefits

**The Ethanol Industry has created professional jobs**

- Molecular and Micro biologists
- Chemists
- Feed nutritionists
- Engineers
- Engineering Technologist
- Stationary Engineers
- Operators
- Machinists
- Research Technicians
- Postdoctoral Researchers
- Maintenance Engineers
- Process Engineers
- Energy Modelers
Energy Security

**Ethanol displaces oil imports…**

**Canada imports more than million barrels a day of oil**

- Canadian renewable fuel displaces 14.15* million barrels of foreign oil/gasoline each year.
- **80%** of the crude oil used for refining gasoline and other products east of Manitoba comes from Saudi Arabia, Algeria, Nigeria, Venezuela and the North Sea.
- What would we do if there was a disruption in oil production?
- Canada’s drivers are hostage to the cost/price of crude controlled by volatile prices.

Total Economic Impact Assessment of Biofuels Plants in Canada; Doytech 2010

** Supply and Disposition of petroleum products – Motor Gasoline – Stats Canada
So what is the elephant in the room?

ETHANOL
• Today we plant a seed to grow 12 billion gallons of ethanol in North America
• Tomorrow we will use energy crops, waste and other biomass
• Water isn’t wasted – it is returned clean to the environment
• Ethanol reduces GHG emissions compared to gasoline
• We create local, rural, high paying jobs and our byproduct is feed for animals
• Costs and prices are more predictable than oil

OIL
• Today we risk the environment by mining the oil sands and drilling the ocean floor
• Producing and using oil pollutes our air and contaminates our water
• Oil production is a major contributor of GHG emissions
• Tomorrow’s oil will be more remote and riskier to find
• Money leaves our country and much of it goes to our enemies
• There is a big cost and prices risk by using oil
The oil company has control of your gas tank.
12 billion gallons of ethanol will be produced in Canada and the US in 2010 – This will grow to 36 billion gallons by 2020
So, let's deal with the bad things you have heard about ethanol

1. Food versus Fuel
2. Energy Balance
3. Brazilian Ethanol is cheaper
The Hard Sell on Salt

Urged to Curb Use, Industry Defends a Vital Ingredient

By MICHAEL ROSS

In a bid to assuage concerns about the health effects of too much sodium, food companies are stepping up their efforts to educate the public on the proper amount of salt to consume. However, critics argue that the industry is working in secret to influence consumer behavior without proper regulation.

According to a recent survey, more than half of Americans eat too much salt, which can lead to high blood pressure and other health problems. The government has been pushing for a reduction in sodium intake, but the food industry has been fighting back, arguing that salt is a necessary component of many foods.

A recent study published in the Journal of the American Heart Association found that reducing salt intake by just a small amount can significantly lower blood pressure and improve overall health. However, the industry has pushed back against public health recommendations, citing the potential for unintended consequences and economic harm.

As a result, some experts believe that the government needs to take a more active role in regulating the food industry and ensuring that consumers are properly informed about the health risks associated with excessive salt intake. In the meantime, individuals can take steps to reduce their salt intake by choosing foods with lower sodium content and being more mindful of their overall diet.
Food for Fuel is a myth. What’s the TRUTH?

Facts:

- The corn used in the production of ethanol is not corn for human consumption; it is industrial corn.
- Only 1% of the corn grown in North America is used for human consumption.
- Field corn is grown on 51% of Ontario’s cropland each year. Other types of corn and popcorn are only grown on 1% of Ontario’s corn acres.
- Industrial corn production in North America is now slightly less than 14 billion bushels per year.
- After growing and manufacturing 12 billion gallons of ethanol; making tonnes of high fructose corn syrup; feeding cows, chickens, turkeys and fish -- 1.9 billion bushels of corn are expected to be exported in 2010, leaving a surplus of 1.8 billion bushels of corn.
- There is no shortage of corn (If you did not make ethanol, what would you do with all that corn?)
- In 2010, the UK government conducted a study and found:

  “[All] available evidence suggests that biofuels had a relatively small contribution to the 2008 spike in agricultural commodity prices. Whilst commodity prices have fallen steeply from their peaks, biofuel demand has remained steady – indicating that the causal link from biofuel demand to short-term crop prices is still relatively weak.”

Sources:
- Ethanol Across America White Paper, Rethinking the Value of Con Ethanol Co-Products in Lifecycle Assessments, ICM Inc.
- Acreage, NASS, USDA, June, 2009
- World Agriculture Supply and Demand Estimates, USDA, July 10, 2009
USDA Predicts Record Corn Crop

Posted by Joanna Schroeder – August 14th, 2010

In the latest forecast issued by the U.S. Department of Agriculture (USDA), corn farmers are on track for a record corn crop and yield per acre for this year. The numbers are estimated to surpass the records set in 2009. USDA expects farmers to harvest 13.37 billion bushels, 2 percent larger than in 2009. They are also projecting 165 bushels per acre, up from 164.7 bushels per acre last year, also a new high.

Renewable Fuels Association Vice President of Research Geoff Cooper notes that the record yields effectively demonstrate that U.S. farmers can meeting increasing demands without needing to expand acreage as well as meet the growing demands for food, feed and fuel.

"This will be the third 13 billion bushel crop on record and it’s worth noting that this year’s crop will be produced on nearly 6 million fewer acres than the first 13 billion bushel crop just three years ago.

Once again, today’s report further undermines the theory that U.S. farmers will need to convert non-agricultural land to cropland to keep up with increasing demand. The rapid adoption of new technologies and practices is allowing the nation’s farmers to continue to produce more grain on fewer acres."

To put the significance of the increase in perspective, this year’s estimated crop will be twice as large and the corn crop produced 30 years ago in 1980 but it will be achieved using only 4.6 percent more acres than in 1980. Also of note, the USDA projects that 4.7 billion bushels of corn will be processed into ethanol for the 2010/11 marketing year, producing approximately 13 billion gallons of ethanol.
Farmers will grow more on less land uses less inputs

- Monsanto is optimistic that corn yield will increase from the 2000 baseline of 137 bushels per acre to 300 bushels per acre in 2030.

- This yield increase will be sustainable – higher yields on the same land using less fertilizers and pesticides.
Monsanto already has the seeds to double corn yield by 2030

We’re optimistic we can double yield in the U.S. by 2030

- **Corn**
  - 2000 Baseline: 137 bu/ac
  - 2030 Goal: 300 bu/ac

- **Soybean**
  - 2000 Baseline: 37 bu/ac
  - 2030 Goal: 80 bu/ac

- **Cotton**
  - 2000 Baseline: 632 lbs/ac
  - 2030 Goal: 1,300 lbs/ac

By continuing to implement proven technological advancements....

- **Breeding**
  - Creates new, more robust varieties that perform better in the field.

- **Biotech**
  - Adds special beneficial genes to the plant.

- **Agronomics**
  - Agronomic practice improvements make acres more productive.
Food production and energy production don’t compete

Land used for energy as a % of land under agriculture production

- The feedstock for ethanol and biodiesel represents 2.3% of the land currently under agricultural production.*

- Head of the Food and Agriculture Organisation (FAO), Jacques Diouf, notes that globally enough food is produced to feed the entire world.

Source: UNEP, Issue paper Bioengery No 1 “LAND USE, LAND USE CHANGE AND BIOENERGY” (Ravindranath et al. 2009)
Myth – ethanol takes more energy to make than you get out of it?
NO!
Energy balance – ethanol is a net energy positive

This report measures all conventional fossil fuel energy used in the production of 1 gallon of corn ethanol. The ratio is about 2.3 BTU of ethanol for 1 BTU of energy inputs, when a portion of total energy input is allocated to by product and fossil fuel is used for processing energy.
Brazilian Ethanol is cheaper

- Brazilian Ethanol is cheaper only when the price of sugar is cheaper. Not now!!!
- We need to put in place safeguards against “dumping” when the sugar price is low to protect our domestic ethanol industry.
Sugar Surges as U.S. Acts to Boost Imports

Limits on Foreign Producers Will Ease to Raise Shipments

By Carol J. Gun and Bill Tomson

Global sugar prices soared on Friday after the U.S. said it will ease import restrictions to help avert a national shortage.

The U.S. Department of Agriculture on Thursday said it will give foreign sugar producers a bigger window to send sugar to the U.S. over the next two months.

World prices for raw sugar reached a five-month high on Friday, rising above 20 cents a pound during the day. Sugar for October delivery finished 2.4% higher at 19.95 cents a pound.

The USDA was responding to intense lobbying from sugar users, who claimed the country was in danger of running out of sugar. The USDA this year has twice increased its import quota at the behest of sugar processors and food manufacturers. The sugar users have long been vocal critics of the government's restrictions on sugar imports, which they argue are designed to protect American farmers by keeping U.S. sugar prices inflated.

Farmers counter that the food companies are just seeking ways to boost profits. U.S. domestic sugar prices are at about 34.13 cents a pound, up 30% in 12 months.

Sugar Futures
Daily settlement price on the continuous front-month contract
Friday 18.95 cents a pound, up 0.47 cent

Last week, the Sweetener Users Association, which represents large food and beverage manufacturers, sent a letter to Under Secretary James Miller of the USDA requesting early entry of next year's sugar imports, “commencing immediately.”

Global sugar prices have surged more than 45% since the beginning of May, largely due to weather-related gains. In Brazil, the world's biggest sugar exporter, confirmed with a spike in demand from the Middle East and Asia during the monthlong Ramadan religious holidays. Also, flooding in Pakistan reduced sugar cane there.

“Supply remains relatively tight in the U.S.,” said Patrick Himber, senior vice president of commodities at Imperial Sugar Co., one of the largest refiners in the country. The USDA's decision makes it easier for some smaller exporters to ship more sugar to the U.S., he said.

Sugar is the second-most common ingredient in many baked products, and bakers are distraught over high prices, said Robb Macle, president and chief executive of the American Bakers Association. The fall is the peak time of sugar use, as many manufacturers start to build up inventories of finished products to go into the winter.

“It's kind of an 11th-hour rescue,” said Robert Lindon, executive vice president of Connell Commodities, a Naperville, Ill., advisory firm for food commodities. “In the next six weeks, I think we are going to be very, very tight.”

Global sugar demand is expected to outstrip supplies by 8.5 million metric tons in the current crop year that runs through Sept. 30, the London-based International Sugar Organization has said. In the following crop year, supplies may outstrip demand by 2.5 million tons, it said.

The U.S.'s ability to tap the broader market is limited by longstanding import restrictions set by law. The so-called tariff rate quota is set every year at slightly more than 1.2 million tons, and the USDA can raise it only in April following the start of the fiscal year in October.
Canada’s Biofuel Industry

- There are 28 renewable fuels plants in Canada (16 ethanol plants).
- These plants produce a total of 2.25 billion litres of renewable fuels annually.
- They generate gross annual economic benefits of $2.139 billion to the Canadian economy across Canada.
- These operations are creating 1,038 direct and indirect jobs annually.
- In September 2010, the Canadian Renewable Fuels Standard mandating 5% ethanol content will come into force.
  - There is currently no public policy in place to grow the industry capacity.

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<thead>
<tr>
<th>Canadian Ethanol Plants, 2010</th>
<th>Capacity (ML per Year)</th>
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<tbody>
<tr>
<td>Aylmer, Ontario</td>
<td>162</td>
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<tr>
<td>Chatham, Ontario</td>
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<tr>
<td>Collingwood, Ontario</td>
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<tr>
<td>Havelock, Ontario</td>
<td>80</td>
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<tr>
<td>Johnstown, Ontario</td>
<td>225</td>
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<tr>
<td>Ottawa, Ontario (R&amp;D facility)</td>
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<tr>
<td>St. Clair, (Sarnia) Ontario</td>
<td>225</td>
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<tr>
<td>St. Clair, Ontario (expansion)</td>
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<tr>
<td>Varennes, Quebec</td>
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<tr>
<td>Minnedosa, Manitoba</td>
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<td>Belle Plaine, Saskatchewan</td>
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<td>Lanigan, Saskatchewan</td>
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<td>Lloydminster, Saskatchewan</td>
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<tr>
<td>Red Deer, Alberta</td>
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What is happening in the US?

Renewable Fuel Standard (EISA)

Future supply will be seen in the cellulosic ethanol technologies
A Flex Fuel Infrastructure is being built in the USA – Canada should follow

- Big 3 Automakers in the USA have committed to making 50% of their vehicles flex fuel (85% ethanol, 15% gasoline) by 2012
- Engine technology is closing the mileage gap (3-4 %) between gasoline and ethanol E-85
- A partnership between the Department of Energy and the ethanol industry in the US is building flex fuel infrastructure.
  - You can drive from Miami to Detroit, Chicago to Houston and from Boston to New York and fill up with E85 all along the way.
Buick Regal to Offer Flex-fuel Capability

General Motors has made another step to bring the sustainable mobility notion from concept to reality, as the automotive producer announced that all 2011 Buick Regals sold starting this fall will offer Flex-fuel capability.

The Buick Regal, which is underpinned by GM’s Epsilon II platform, has just been introduced to the U.S. auto market and currently comes with a naturally aspirated 2.4 liter four cylinder engine that offers 184 hp. A turbocharged 2.0 liter Ecotec four cylinder developing 220 hp is scheduled to be offered starting from late summer.

After the forced induction powerplant is introduced, GM will make both units: available with gasoline and E85 ethanol, making the turbo unit its first series production E85 turbocharged and direct injected engine.

Jim Fredenho, vehicle line director for the global midsize platform, explained that using direct injection and turbocharging will allow the fresh powerplant to post an ethanol efficiency that is close to that registered while in the gasoline operating mode. This is an important achievement, as most previous naturally aspirated flex-fuel units register a 15 percent drop in efficiency when using ethanol (as opposed to gasoline).

The Buick Regal (initially only available with the premium CXL equipment level) powered by the 2.4 liter normally aspirated engine starts at $26,995, while the upcoming model, which will use the 2.0 liter turbocharged powerplant, will start from $29,495, with both prices including a $750 destination charge. The first engine will offer a highway fuel consumption of 30 mpg, with the second unit posting a figure of 29 mpg.
“First generation corn grain ethanol is a critically important renewable fuel source that is lowering our reliance on foreign petroleum fuels, and cellulosic ethanol will soon be contributing as well. ... To reach and exceed our biofuels targets, we will need to take a new strategic approach that continues to support the existing biofuels industry and accelerates the creation and rapid commercial deployment of new technologies so our Nation’s efforts to establish an advanced biofuels industry are met.”
**Mission:** To advance the energy, economic, and environmental security of the U.S. by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption in the transportation sector.

- Celebrated 15 Year Anniversary in 2009
- Companion program to the EPACT mandates requiring certain fleets to acquire AFVs (Federal, State, and Fuel Provider Fleets)
- Focus on **Deployment** (next steps after R&D is completed)
- Clean Cities is funded and managed by DOE-HQ in Washington, DC. DOE Regional Project Management Centers located in Pittsburgh, PA; Morgantown, VA, and Golden, CO guide coalitions and manage projects.
- National Renewable Energy Laboratory, Argonne National Laboratory, Oak Ridge National Laboratory provide technical expertise.
Chicago to Houston
Plus Detroit to Miami and
New York to Boston under construction
US –Current Market Status – Vehicle and Infrastructure

- 8 million flex fuel vehicles on the road (3% of US vehicles) and adding 800,000 to 1 million each year
- Over 2,200 E85 and ethanol blender stations
- Over 60 E85/blender stations per month being installed
GreenField is investing in second generation ethanol

The first step is ethanol from non traditional feedstocks…

- **Cellulosic Ethanol using fermentation to convert biomass to ethanol.**
  - Today we are making ethanol from corn cobs using GreenField’s patented technology. This technology is the foundation for making ethanol from other agricultural products and forestry waste.
  - Engineering is complete for the commercial demonstration plant. Construction will start in 2010.
- **Cellulosic Ethanol using Gasification to convert municipal solid waste to ethanol.**
  - GreenField is in partnership with Enerkem for future Ontario and Quebec plants. Enerkem’s first plant is being built in conjunction with the City of Edmonton waste diversion department. The Enerkem technology used for feedstock-waste paper, cardboard, plastics, packaging, sawdust, woodchips etc. and makes ethanol (or methanol).
  - The next plant will be built at GreenField’s Varennes, Quebec location
Biochemical Research Laboratory
Biochemical Pilot Plant
The pretreatment pilot plant
Is there anything wrong with Ethanol? Should it become a more important part of the transportation fuel mix in Canada?
Will biofuels really make a difference?

Health --- Economy -- Security -- Environment

Currently, the ethanol industry replaces 364 million barrels of imported oil each and every year in the USA and Canada.

A major study by the Windmill Group identifies 645,000 jobs created by ethanol in the USA and $92 billion.

First generation ethanol has 59 percent fewer Greenhouse Gas Emissions when compared to conventional gasoline.

Cellulosic ethanol, the second generation of renewable fuels, is 90 percent cleaner than gasoline, and with the current feed stock of biomass, there is enough biomass in the USA alone to produce 85 billion gallons (61% of the gasoline that is used in the US every year) of cellulosic ethanol annually.
Governments Role

Pass the Renewable Fuels Standard regulations.

Support the development of cellulosic ethanol.
Addendum

1. Water Usage
2. ILUC
3. Subsidies
*Ontario Corn Producers Association http://www.ontariocorn.org/envt/envview.html
Ontario corn farmers have Environmental Farm Plans and are committed to continuous improvement

Environmental Farm plans require documenting. EFP’s raise awareness about environmental risks and opportunities on farm operations. As part of their EFP, farmers develop action plans to identify management practices that can reduce environmental risk on their operations. Environmental Farm plans are all about continuous improvement in the following 23 areas.

1. Soil and Site Evaluation
2. Water Wells
3. Pesticide Handling and Storage
4. Fertilizer Handling and Storage
5. Storage of Petroleum Products
6. Disposal of Farm Wastes
7. Treatment of Household Waste
8. On-Farm Storage of Livestock Manure and Other Prescribed Materials
9. Livestock Yards and Outdoor Confinement Areas (OCAs)
10. Silage Storage
11. Milking Centre Washwater
12. Nuisances under the Farming and Food Production Protection Act, 1998
13. Water Efficiency
14. Energy Efficiency
15. Soil Management
16. Nutrient Management in Growing Crops
17. Manure Use and Management
18. Horticultural Production
19. Field Crop Management
20. Pest Management
21. Stream, Ditch and Floodplain Management
22. Wetlands and Wildlife Ponds
23. Woodlands and Wildlife
Indirect Land Use Change (ILUC) assumes that growing grains for biofuel production displaces other crops, which are then grown in other parts of the world, leading to deforestation. The theory is flawed, speculative and withstands no credible scrutiny.

According to the National Institute of Space Research, deforestation in the Amazon has declined sharply just as American biofuels production doubled. In 2004, 10,588 square miles of the Amazon was deforested and in 2008, that number dropped to 4,621 square miles. Meanwhile, U.S. ethanol production has gone from approximately 3 billion gallons in 2004 to approximately 9 billion gallons in 2008.
The theory employs no empirical evidence and is highly controversial. No consensus in the scientific community as to its validity has been achieved. The data/facts contradict the theory. Many scientists challenge the credibility of economic models used to approximate the theoretical values of GHG missions projected from ILUC.

Even EPA Administrator Jackson noted the significant uncertainties associated with ILUC in a Sept. 23, 2009 letter to Senator Harkin

Thanks to advances in technology, corn farmers have consistently increased crop yields so that today, they grow five times as much corn as in the 1930s on 20 percent less land. Average corn yields have gone from 91 bushels per acre in 1980 to 152.8 bu/acre in 2007. Similarly ethanol yields have increased from 2.4 gallons per bushel in 1980 to 2.81 gal/bu in 2007.
CA LCFS Asymmetries

Carbon Intensity of Tomorrow’s Fuels

- Derived from economic modeling
- No economic modeling conducted for petroleum or other alternative fuels
- CI Intensity Driven Down by Policy Considerations

Bar chart showing:
- Carbon intensity (CO2e/MJ)
- Baseline
- 2020 Goal

Fuels compared:
- Gasoline
- Sugarcane Ethanol
- Corn Ethanol from coal
- Corn Ethanol from natural gas
- Soybean Biodiesel
- Cellulosic Ethanol
- Cellulosic Ethanol (Waste)
- Electricity
- Hydrogen

4/23/2009

Energy Crops
According to a 2010 report from the International Energy Agency fossil fuels receive $550 billion dollars in subsidies world wide.

IISD’s [Global Subsidies Initiative (GSI)](http://www.iisd.org/gsi) is undertaking a detailed study of Canadian fossil fuel subsidies provided by the federal government and three key provincial governments: Alberta, Saskatchewan and Newfoundland and Labrador. Initial findings show that the oil industry currently benefits from more than 40 different subsidy programmes, mostly in the form of preferential tax treatment and investment incentives for exploration and drilling. The results of the study are due to be published in October 2010.