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Canada

Bio-Fuels

Bio Fuels Canada

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Report Highlights:
Canada has only recently begun to promote and expand its ethanol and bio-diesel industries. In 2005, Canadian biofuel production was approximately 240 million liters (ml), and imports from the US reached 70ml. The Government of Canada (GOC) has mandated that, by 2010, 5% of all motor vehicle fuel be biofuel which would raise national demand to 3 billion liters (bl) a year. Through current federal and provincial incentives, biofuel production is projected to grow to 1.6 bl by 2008 , 90% of which is ethanol. However, the major federal initiative program has exhausted its funds. Therefore, to meet the ambitious 3 bl target by 2010, the federal and provincial governments need to agree on a national policy complete with financial support. A national strategy is expected to be announced in the fall of 2006. The impact on Canadian agriculture, especially on the corn and wheat markets, is potentially significant, with demand for both crops expected to rise dramatically.

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Executive Summary

Canada has only recently begun to promote and expand its ethanol and bio-diesel industries. In 2005, Canadian ethanol and biodiesel production was 230 million liters and 9 million liters respectively. National demand by the motor fuel industry in 2005 was 300 million liters, and US imports, approximately 70 million liters, make up the difference in supply. The Government of Canada (GOC) has mandated that, by 2010, 5% of all motor vehicle fuel be ethanol or bio-diesel, which, if met, would raise national demand to 3 billion liters a year. Through current federal and provincial incentive programs, national ethanol and bio-diesel production is projected at 1.5 billion liters of ethanol by 2008 and 100 million liters of bio-diesel. However, the major federal initiative, the Ethanol Expansion Program (EEP), has exhausted its funds, and, therefore, to meet the ambitious 3 billion liters a year target by 2010, the federal and provincial governments need to agree on a concrete national policy complete with financial support. A national strategy is expected to eventually be announced in the fall of 2006. The impact on Canadian agriculture, especially corn and wheat imports/production, is potentially significant with demand for both crops expected to rise dramatically, should the ambitious 5% biofuels mandate be met. Canadian ethanol production is also expected to eventually shift west to the Prairie Provinces to be close to Canada's wheat growing regions.

Domestic Policy Environment

Policies Supporting Production and/or Use of Bio-Fuels

Since the 1980s, there have been different policies promoting ethanol production and usage in Canada. The early initiatives were provincial, with Manitoba, Saskatchewan and Ontario exempting the ethanol portion of blended motor fuel from the provincial excise tax. Eventually, the federal government and most of the provinces introduced a variety of tax exemptions for ethanol. In 2003, the GOC allocated C$ 160 million for an Ethanol Expansion Program (EEP), part of its climate change plan for Canada, to promote its infant ethanol production industry in order to lower greenhouse gas emissions. Of this, approximately C$ 118 million went to finance the construction and expansion of fuel ethanol production facilities across Canada, C$ 40 million was allocated for contingent loan guarantees, and C$ 3 million was budgeted for a public awareness campaign.

The EEP program and the introduction of federal and various provincial tax exemptions fueled the Canadian ethanol industry's projected expansions over the next couple of years. From 2001 to 2005, ethanol production in Canada changed very little, hovering around 230 million liters a year. However, with new and expanded plants coming into operation in 2006, 2007 and 2008, national ethanol production is forecasted to rise to an estimated 1.3 billion liters a year and production capacity to 1.5 billion liters a year by 2008.

In addition to the federal government's EEP, different provinces have implemented a number of measures:

Alberta: 9 cents/liter provincial tax exemption.

British Columbia (BC): 14.5 centers/liter provincial tax exemption. The ethanol must be produced and consumed in BC to be eligible.

Manitoba: 20 cents/liter provincial tax exemption until August 2007.
15 cents/liter from September 2007 to August 2010
10 cents/liter from September 2010 to August 2013
To be eligible for the exemption, the ethanol must be produced in Manitoba.

Ontario: 14.7 cents/liter
Ontario intends for all gas sold to contain 5% ethanol by 2007 and 10% by 2010.

Quebec: 20 cents/liter provincial tax exemption. The ethanol must be produced in Quebec to be eligible for the exemption.
Quebec has mandated a 5% ethanol mandate for 2012, and has put its focus on cellulosic ethanol.
Income tax credit for ethanol producers.

Saskatchewan: 15 cents/liter provincial tax exemption. The ethanol must be produced and consumed in Saskatchewan.
Saskatchewan has mandated 1% of all fuel to be ethanol/bio-diesel, rising to 7.5% in mid-2006. This 7.5% will be met by the opening of Husky Oil's ethanol plant in Lloydminster.

In early 2006, the newly-elected Conservative government reaffirmed Canada's commitment to the environment and its obligations under the Kyoto Protocol by mandating that 5% of all fuels consumed in the transportation sector be bio-fuels by 2010. If this mandate is to be met, demand for ethanol and biodiesel must rise to 3 billion liters annually by 2010. Given that Canada's 2005 bio-diesel production is only 9 million liters, the vast majority of biofuel demand will need to be filled by either Canada's ethanol industry, which would have to double its expected 2008 production capacity (1.5 billion liters) by 2010, or by imported US ethanol.

The largest obstacle for further ethanol expansion in Canada to meet a 5% biofuel target with Canadian production is the lack of a firm national policy. For example, it is unclear whether the 5% target is a national average or if each province or territory will have to meet it – something that will be difficult to achieve in the Atlantic Provinces and Northern Territories, where there is no current or planned ethanol production. A detailed national renewable fuels policy could also spur ethanol production by eliminating loopholes or inconsistencies in provincial provinces. For example, ethanol produced in Alberta is exempted from Alberta's gas tax, but not exempted from the tax in neighboring British Columbia or Saskatchewan since the exemptions there are only for locally-produced ethanol.

Another important question is whether the GOC is committed to see the 5% demand met completely by Canadian production. As it is a current net importer of ethanol, and it lacks sufficient production facilities to meet its projected 2010 projected demand, Canada will likely resort to importing ethanol from the US. To meet the 3 billion liters of expected demand by 2010, the GOC needs to financially promote the ethanol industry through backing plant construction and loan guarantees for any expansion to take place beyond the current construction and expansion projects. The GOC is expected to announce a national strategy in the fall of 2006.

In anticipation of a new federal government strategy, in July 2006, the Canadian Renewable Fuels Association (CRFA) unveiled a comprehensive plan to implement the federal government's commitment to require 5% renewable content in Canadian gasoline and diesel fuel. CRFA's recommended policies include a requirement for an average of 5% renewable fuel content in Canadian fuel, tax credits for ethanol and biodiesel production instead of the existing federal excise tax exemption, and programs to encourage farmer equity investment in renewable fuels production facilities and to support emerging technologies. CRFA hopes that the GOC will use its plan as a roadmap in designing its federal policy, such that an

efficient national Canadian biofuels industry is created and can compete with imported products.

Size of Energy Market

Unlike the United States, energy security is not a factor behind the recent and projected growth in Canada's ethanol industry. Canada has the world's second largest proven oil reserves, with 178.8 billion barrels, 95% of which is in the tar sands of the Western Provinces. In 2005, Canada produced 3.1 million barrels of oil daily and exported approximately 1.9 million barrels daily, 99% of which went to the US. From 1997 to 2004, Canada's oil production rose 19.5% due to new oil sands and offshore projects replacing aging fields. This sharp rise in production, coupled with high oil prices, has spurred an economic boom in the Western Provinces, especially in resource-rich Alberta.

Energy demand in Canada has risen 17% between 1997 and 2003, with motor vehicle consumption rising 12.7%, due largely to steady positive economic growth and the expansion of oil production in the western tar sands. Oil extraction from tar sands is energy intensive, requiring a large quantity of fuel. Canada's Eastern Provinces, where the bulk of Canadians live, are net oil importers. Some of this oil comes from the western provinces, but most comes from Europe and the Middle East, due to better transportation networks.

Growth in Canadian Production, Consumption and Net Exports, 1997-2004

Canadian Production	1997	1998	1999	2000	2001	2002	2003	2004
(Thousand of barrels per day)	2,626.7	2,700.5	2,631.3	2,749.4	2,812.5	2,949.7	3,109.6	3,135.2
		2.8	-2.6	4.5	2.3	4.9	5.4	0.8
					Total Growth		**1997-2004**	**19.4**
Canadian Consumption								
(Thousand of Barrels per day)	1,956.2	1,942.0	2,027.0	2,027.0	2,043	2,082	2,208	2,294
		-0.7	4.4	0.0	0.8	2.0	6.0	3.9
					Total Growth		**1997-2004**	**17.3**
Net Exports of Petroleum	0.781	0.883	0.759	0.792	0.817	0.992	0.992	1.036
(Millions of Barrels of Oil per day)		13.0	-14.0	4.4	3.2	21.5	0.0	4.4
					Total Growth		**1997-2004**	**32.6**

Source: Energy Information Agency, US Dept. of Energy

Motor gasoline and diesel account for approximately one fifth of total energy consumption in Canada, which is roughly the same percentage the transportation sector holds in Canadian energy demand. Within the transportation sector, gasoline and diesel account for the vast majority of fuel used, approximately 87%.

Total Energy Use 2003	(PJ)	%
Natural Gas	3,266.6	29.7
Motor Gasoline	1,408.0	12.8
Diesel Fuel Oil, Light Fuel Oil and Kerosene	1,067.4	9.7
Heavy Fuel Oil	647.6	5.9
Aviation Turbo Fuel	222.5	2.0
Coal	3,089.9	28.1
Coke and Coke Oven Gas	612.7	5.6
Propane	17.3	0.2
Wood Waste and Pumping Liquor	574.6	5.2
Other	87.4	0.8
Total	10,994.0	

Source: Natural Resources Canada

Total Energy Use by Sector 2003	(PJ)	%
Agriculture	211.9	1.7
Commercial	1,180.9	9.7
Industrial	3,245.7	26.6
Residential	1,457.6	12.0
Energy Production	3,726.7	30.6
Transportation	2,361.3	19.4
Freight	945.8	7.8
Passenger	1,322.4	10.9
Other	93.1	0.8
Total	12,184.1	

Source: Natural Resources Canada

Energy Consumption, Transportation Sector 2003	%
Motor Gasoline	57.4
Diesel Fuel Oil	29.5
Heavy Fuel Oil	2.8
Aviation Turbo Fuel	9.4
Other	0.8

Source: Natural Resources Canada

Bio-Fuels Production Capacities, Current and Planned

Currently, Canada is in between two stages of major expansion with regard to renewable fuel production, with the EEP funds dried up, but a further need for new plants. Canada, over recent years, has been producing between 180 and 230 million liters of ethanol annually. It only recently began producing significant volumes of bio-diesel; 2005 biodiesel production was approximately 9 million liters. Canadian demand for ethanol has outstripped its production by around 70 million liters of ethanol annually, with US imports making up the difference. By 2008, however, ethanol production capacity is set to rise to around 1.5 billion liters per year.

Approximately 70% of Canada's ethanol production capacity is based in Ontario, and the planned plant constructions and expansions will largely keep to this ratio. However, even with this large expansion in production capacity, 2008 forecasted production is still half of what is required for the 3 billion liters demanded by 2010 under the government's 5% mandate. If the GOC decides to meet this mandate with Canadian production, further expansion of the industry beyond 2008 may lead to increasing usage of wheat as a feedstock as the demand to meet this ethanol production goal is unlikely to be filled by domestic corn production without large increases in corn imports.

Ethanol Production Plants (Current, Expanding, Under Construction and Planned)

Status	Location	Company Name	Primary Feedstock	Expected Capacity (million liters)
Expanding	Red Deer, Alberta	Permolex	Wheat	40
Planned	Kelowna, BC	Ekanagan Biofuels, Inc*	Wheat	113
Construction	Minnedosa, Manitoba	Husky Energy, Inc*	Corn	130
Construction	Brantford, Ontario	Integrated Grain Processors Coop	Corn	119
Expanding	Chatham, Ontario	Commercial Alcohols, Inc.	Corn	300
Construction	Collingwood, Ontario	Power Stream Energy Services	Corn	52
Construction	Cornwall, Ontario	Seaway Grain Processors, Inc*	Corn	66
Construction	Sarnia, Ontario	Suncor Energy Products*	Corn	208
Open	Tiverton, Ontario	Commercial Alcohols, Inc.	Corn	40
Construction	Windsor, Ontario	Commercial Alcohols, Inc.	Corn	199
Construction	Varennes, Quebec	Commercial Alcohols, Inc.*	Corn	120
Open	Lanigan, Saskatchewan	PoundMakter Agventures	Wheat	12
Construction	Lloydminster, Saskatchewan	Husky Energy, Inc *	Wheat	130
Construction	Weyburn, Saskatchewan	NorAmera BioEnergy Corp*	Wheat	25
Active	Ottawa, Ontario	Iogen	Straw	1
* EEP fund recepients			Total:	1.55bn

Source: Canadian Renewable Fuels Association (CRFA)

To double the 2008 projected production capacity (1.5 billion liters) to the expected 2010 demand (3 billion liters), Canada will need to provide financial incentives for ethanol producers similar to those provided in the EEP, such as financing plant construction/expansions and loan guarantees. As of now, the federal government has not released a national strategy to meet the expected demand, but is currently writing one set to be released in the fall of 2006. While the current differences in provincial tax exemptions do not greatly affect production decisions, a combination of lower oil prices and higher grain prices could make certain provincial tax-exemption restrictions an obstacle to expanding the industry.

Canada's small, but growing, bio-diesel industry produced around 9 million liters in 2005, but its 2006 and 2008 production capacity is forecast at 60 million liters and 100 million, respectively. The majority of biodiesel feedstocks in Canada are animal fats, recycled cooking oils, vegetable oils and marine oils. One important question for the bio-diesel industry is whether part of the 5% mandate will be set aside for bio-diesel. There is some speculation that the government will set a 2% bio-diesel mandate, and, if so, most of this increase will likely come from canola. However, given Canada's current limited capacity in bio-diesel it seems unlikely that the government will establish this 2% mandate, at least in the short-term.

Biodiesel Production Plants (Current, Expanding, Under Construction and Planned)

Status	Location	Company Name	Capacity (million liters)
Expanding	Foam Lake, Saskatchewan	Milligan Bio-Tech	4.5
Active	Montreal, Quebec	Rothsay	35
Expanding	Hamilton, Ontario	BIOX Corporation	60
Construction	Sturgeon County, Alberta	Canadian Bioenergy	114

Source: CRFA

Only one multinational corporation, ADM, has involved itself in the production of Canadian ethanol. ADM has invested in Husky's large wheat-based ethanol production facility in Lloydminster, Saskatchewan. To date, multinationals have not expressed interest in Canadian produced ethanol, seeing it primarily as a market for US–produced ethanol.

Import Regimes for Bio-Fuels

Neither Canadian ethanol nor bio-diesel is protected by any import tariff or quota.

Biofuels Statistics and Analysis

Ethanol Trade, Bio-Diesel Trade, Corn Sweetener Trade

The ethanol trade captured here is mostly industrial ethanol. Canadian imports of fuel ethanol are exclusively from the US, and for the 2002-2004, these imports have hovered around 70-100 million liters a year. There is no official data available for either fuel ethanol or biodiesel trade.

Year	Ethanol Production (millions of liters)	Ethanol (Liters of Pure Alcohol - Industrial Ethanol Imports	Ethanol (Liters of Pure Alcohol - Industrial Ethanol) Export	Sweetener Imports	Sweetener Export
2001	180	37,449,819	10,720,391	30,107	29,470
2002	180	28,474,066	9,148,103	39,335	23,182
2003	180	41,962,513	5,953,464	36,040	29,190
2004	200	43,688,192	8,580,178	28,006	22,369
2005	225	42,584,381	12,567,157	46,596	28,567

Source: Ethanol Production figures from CRFA
Ethanol and Sweetener trade figures from World Trade Atlas

The GOC does not carry data on sweetener production, or total use, nor was industry willing to provide those figures.

Ethanol Produced from Corn

Although there are no official government statistics on the amount of corn used in Canada's ethanol industry, private sources estimate that, from 2001-2005, between 320,000 and 560,000 MT of corn was used annually. This figure is set to rise to 1 MMT in 2006 due to expected increases in ethanol production in eastern Canada. These numbers include both U.S. and Canadian corn destined for ethanol production.

Corn is the main feedstock for Canadian ethanol production. Not coincidentally, Ontario is the largest corn producing province in Canada and where 70% of Canadian ethanol

production is based. In 2006, Canada is forecast to produce 8.9 MMT of corn and to import 2.9 MMT, mainly from the US. With the forecasted expansion of the ethanol industry, private sources estimate that an additional 1.67 MMT of corn will be needed by 2008.

Thousands of Metric Tons

Year	Corn Production	Corn Imports	Corn Total Supply	Corn for Export	Corn for Feed	Corn for Ethanol*
2001	8,389	3,843	13,112	199	9,544	320
2002	8,999	3,902	13,957	313	10,121	320
2003	9,600	2,500	13,211	300	9,500	320
2004	8,836	2,385	12,365	242	7,951	360
2005	9,470	1,716	12,979	253	8,297	560
2006 (f)	8,855	2,900	13,555	285	8,642	1,000

Source: USDA; Corn for Ethanol estimates derived from CRFA figure (conversion: 1 bushel of corn = 10 liters of ethanol)

Ethanol Produced from Wheat

Wheat is the feedstock for the remaining 30% of Canada's ethanol production. Like corn, there are no official government statistics on the amount of wheat used in Canada's ethanol industry, although private sources estimate it at 160,000 MT tons in 2005. This amount is forecast to rise to 450,000 MT in 2006. By 2008, the openings of wheat-based ethanol plants in Western Canada will increase the demand of wheat destined for ethanol production to an estimated 1.84 MMT.

Thousands of Metric Tons

Year	Wheat Production	Wheat Imports	Wheat Total Supply	Wheat for Export	Wheat for Feed	Wheat for Ethanol*
2001	20,568	97	30,323	16,415	3,342	150
2002	16,198	178	23,105	9,030	4,188	150
2003	23,500	30	29,180	16,100	3,300	150
2004	25,860	243	31,954	14,812	5,056	160
2005	26,775	270	34,790	16,050	5,056	160
2006 (f)	26,300	11	35,881	18,700	4,691	450

Source: USDA; Wheat for Ethanol estimates derived from CRFA figure (conversion: 1 bushel of wheat = 10 liters of ethanol)

Unlike corn, Canada produces ample quantities of wheat, which could be used to meet ethanol production expectations. As the ethanol industry grows, demand for different wheat varieties is also expected to grow as is competition between wheat end users, such as the Canadian ethanol and livestock producers. More Canadian wheat farmers are expected to switch more seeding area from higher protein/lower starch wheat to lower protein/high starch wheat such as Winter Wheat and Canadian Prairie Spring Wheat. A sharp spike in wheat-based ethanol demand could create competing demands in other sectors of Canadian agriculture, especially in the hog sector, which tends to use the same wheat varieties that ethanol production does.

If the GOC is set on meeting the 5% mandate with Canadian-produced ethanol, plant expansions beyond 2008 will need to be made in the wheat-based ethanol market. However, wheat-based ethanol in Western Canada could find better markets in the western US than in Canada's Eastern Provinces, due largely to the geographic distances ethanol would have to

be transported. Likewise, Midwestern US-produced ethanol could find a better market in Canada's Eastern Provinces than in the Western US.

In addition to its environmental reasons for promoting ethanol production, the Canadian government, through EEP, has strongly promoted ethanol consumption as one avenue to increase farmer income – an idea with universal political appeal and one that will likely be further supported in the federal government's soon-to-be announced national biofuels strategy. The Canadian Wheat Board also promotes industrial uses for its western-grown grains; however, its current position is that although its mandate allows it to enter the market for sales of wheat for ethanol production, it will not do so.

As Canada does not produce enough corn to meet domestic demand, the difference will most likely be made up by imports of US corn. However, with the US ethanol industry itself expanding and US demand for corn rising continually, the Canadian ethanol industry could face tighter competition and, therefore, higher prices, squeezing the viability of a Canadian corn-based ethanol industry. The key unanswered question is whether Canada will drive to meet its own ethanol demands or increasingly import it from the US.

Ethanol Produced from Sugercane or Sugar Beets

Canada does not produce ethanol from sugarcane or sugar beets, nor are there any expectations that it will.

Bio-Diesel Produced from Canola and Animal Fats/Oils.

Canada's bio-diesel production capacity is forecast to grow rapidly in the next three years to around 260 million liters annually due to the construction and expansion of new facilities. Annual bio-diesel production is expected to expand ten-fold, from its current 9 million liters to roughly 100 million liters by 2008. However, while the industry is expected to grow significantly, it will play a smaller role in meeting Canada's overall bio-fuel demand. Most of the current and forecasted increase in bio-diesel comes from rendered animal by-products. Industry sources put a ceiling on potential production from rendered animal fats at 250 million liters – a figure unlikely to be realized given current biodiesel plant production capacity.

There has been some speculation that in addition to the 5% bio-fuel mandate, the government will mandate 2% bio-diesel. If so, the main feedstock of biodiesel production would shift to canola. For this to occur, there would have to be a large investment in canola crushing capacity and construction of bio-diesel plants. At the 2% level, it is expected that approximately 0.7-1.1 MMT of canola would be used to in the production of bio-diesel.

Canada does produce enough canola to meet the higher estimate of 1.1 MMT, but it does not have the crushing capacity. Therefore, Canada would either have to invest heavily in further capacity or send its canola to the US for crushing. There is little likelihood, however, that the GOC will announce a 2% bio-diesel mandate, at least in the short-term.

Canadian Canola Production / Trade

Thousands of Metric Tons

Year	Canola Production	Canola Imports	Canola Total Supply	Canola for Export	Canola for Feed
2001	4,926	226	6,240	2,673	174
2002	4,178	240	5,518	2,394	155
2003	6,771	130	7,907	3,763	142
2004	7,728	108	8,444	3,412	372
2005	9,660	125	11,414	4,500	614
2006 (f)	7,300	130	10,430	4,700	600

Source: USDA

Fuels Produced from Other Bio-Mass

Canada does not produce significant quantities of biofuels from other plant matter. Iogen does operate an Ontario plant, which produces cellulosic ethanol mainly from straw and has an annual production capacity of approximately 1 million liters. It plans to build a full-scale commercial plant in the next year, with others to follow. It has financial backing from private companies, but has need of a government entity as a loan guarantor.

Conclusion

Canada is in an interim stage of its biofuel production. The EEP funded a large expansion in Canada's ethanol production capacity, which is set to grow to 1.5 billion liters by 2008. However, these funds have been exhausted. The Conservative government in Ottawa recently announced a mandate of 5% of all motor vehicle fuel be biofuel by 2010, though it has not yet provided details on government support measures or incentives; nor has it given any indication of whether the 5% mandate will be met by Canadian production alone.

In 2005, Canadian production of ethanol and biodiesel was 230 million and 9 million liters, respectively, and demand is estimated at 300 million liters, with US imports making the difference. By 2008, the production capacity of Canada's ethanol industry is forecasted to rise to 1.5 billion liters a year, and biodiesel production is forecasted at 100 million liters. However, even with these large increases in production capacity, the Canadian biofuels industry will be short of the 3 billion liters it needs by 2010 to meet the 5% mandate.

The effect on Canadian and US agriculture is potentially significant, especially for US corn and wheat exports. If the 2008 ethanol production figure forecast by private sources is to be met, demand for corn and wheat for ethanol production alone will rise to 2.67 MMT and 1.84 MMT, respectively. If realized, this would put enormous pressures on competing end user industries and would fuel demand for additional imports, especially of corn. These import demands will likely be met by the United States, although that will be dependent on the effect US ethanol policy is having on the US corn and wheat crops. As Canada is a significant producer and exporter of wheat, the country can be expected to meet its demand for wheat-based ethanol and to gradually shift more of its ethanol production plants out west to the Prairie Provinces. Finally, much will depend on government policy and the Conservative government's determination to implement the measures necessary to achieve its ambitious 5% biofuels goal.