

Feed Grain Policy - Fuel or Food?

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■ Introduction

The global dependence on fossil fuels is apparent and the changing climate is of increasing concern internationally. Both these issues have spurred many governments to look to the agricultural sector for alternative, renewable forms of energy supply; one of which is ethanol. On a volume basis, ethanol produced from corn reduces greenhouse gas emissions by 15 - 26% compared to conventional gasoline (US Department of Energy, 2006a). It is non-toxic, water soluble and biodegradable so it poses no threat to water supplies or water ecosystems (Renewable Fuels Association, 2005). Ethanol blends also reduce tailpipe carbon emissions along with other toxic emissions (Canadian Renewable Fuels Association, 2006a). Finally, as a new industrial use for corn and feed grains, ethanol presents the prospect of increasing corn and feed grain prices. These perceived benefits have spurred interest in ethanol as an ingredient blended in gasoline.

The ethanol industry in North America has seen significant expansion in recent years. Production capacity in the United States grew by 150% from January 2000 to January 2006 (Renewable Fuels Association, 2006b). The Canadian capacity to produce ethanol is much smaller than the US (615 million litres per year in Canada versus 19 billion litre per year capacity in the US). However, the Canadian industry has seen a 158% increase in capacity in the past 2 years (Olar et al. 2004; Ethanol Producer Magazine, 2006).

At the same time, ethanol competes with livestock for corn supplies. Increased ethanol production thus stands to increase corn prices, to the detriment of feed users of corn and feed grains. Conversely, ethanol production generates by-products that are high protein feed stuffs. This paper discusses the expansion of ethanol production and some potential implications for the swine industry.

■ Expansion of the Ethanol Industry in North America

Government commitments, both domestic and international, are significantly influencing the biofuels market. Canada and the United States have both made commitments to increase the quantity of renewable fuels for transportation.

In Canada, the federal government announced its goal to have renewable fuels constitute 5% of transport fuels by 2010 (AAFC, 2006). Complimenting this, several provinces implemented legislation to ensure renewable fuel content in transportation fuels. In December 2003, Manitoba enacted the Biofuels Act¹ which requires 85% of gasoline sold in the province to have a 10% ethanol blend (Manitoba Government, 2006). In October 2005, Ontario legislated that all gasoline in the province have an annual average of 5% ethanol content beginning January 2007 (Ontario Ministry of Environment, 2006). Saskatchewan's Ethanol Fuel Act and its regulations require a 7.5% ethanol blend as of October 15, 2006 (Saskatchewan Government, 2006).

The United States Energy Policy Act, 2005 created a Renewable Fuels Standard requiring gasoline sold within the country to be mixed with increasing amounts of renewable fuel on an annual average basis. **Table 1** gives the schedule for volume of renewable fuels as set out by the Act. The US government is also moving forward with the next technological advancement within the ethanol industry, producing ethanol from cellulosic biomass. Beyond 2013, the renewable fuel requirement will include a minimum of 250 million gallons (946.35 million litres) of cellulosic ethanol² (US Department of Energy, 2006b).

Table 1. Schedule for Volume of Renewable Fuels (US Government, 2005)

Calendar Year	Volume of renewable fuel (billions of gallons)	Volume-Metric equivalent (billions of litres)
2006	4.0	15.14
2007	4.7	17.79
2008	5.4	20.44
2009	6.1	23.09
2010	6.8	25.74
2011	7.4	28.01
2012	7.5	28.39

¹ The Manitoba Biofuels Act will be proclaimed when there is sufficient ethanol production capacity in the province to meet the demand of a 10% blend.

² The term 'cellulosic biomass ethanol' means ethanol derived from any lignocellulosic or hemicellulosic matter that is available on a renewable or recurring basis, including: dedicated energy crops & trees; wood & wood residues; plants; grasses; agricultural residues; fibers; municipal solid waste; animal wastes and other waste materials.

Ethanol Production in the United States

The vast majority of ethanol production uses corn as the feedstock, from which the starches are extracted, fermented and ethanol produced. Only 7 of 106 (less than 1%) of ethanol plants in the United States do not use corn as their feedstock (Renewable Fuels Association, 2006a).

The latest data from the Renewable Fuels Association (October 2006) indicates 106 ethanol plants in operation with a capacity of more than 19 billion litres (Renewable Fuels Association, 2006a; Dow Jones Newswires, 2006). Further expansion of the industry is already underway with an additional 45 plants under construction and 7 of those already in existence undergoing expansions. These additions are expected to add an additional 12.9 billion litres to US production capacity. Upon completion the United States will have the capacity to produce approximately 32 billion litres per year (Renewable Fuels Association, 2006a; Dow Jones Newswires, 2006).

As depicted in **Figure 1** ethanol production has tripled in the past 10 years. In 2005, the US produced 14.78 billion litres of ethanol, energetically equivalent to 1.72% of domestic gasoline usage (Renewable Fuels Association, 2006b; US Department of Energy, 2006b as cited in Hill et al., 2006).

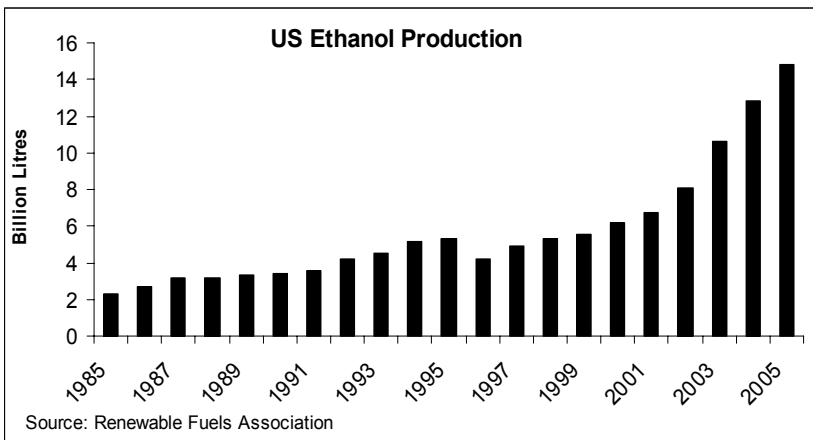


Figure 1. US Ethanol Production

In 2005, 1.43 billion bushels of corn, or approximately 13% of the U.S. crop were used for ethanol production (Renewable Fuels Association, 2006b). Ethanol represents the third largest market for US corn, behind livestock feed and exports (Renewable Fuels Association, 2006b). The US Department of Agriculture (USDA) estimates that about one-fifth of the entire US corn crop, or 2.15 billion bushels, will be devoted to ethanol production in 2006 (Dow Jones Newswires, 2006). The trend of corn used in ethanol production in the

United States (**Figure 2**) reiterates the significance of corn to the ethanol industry.

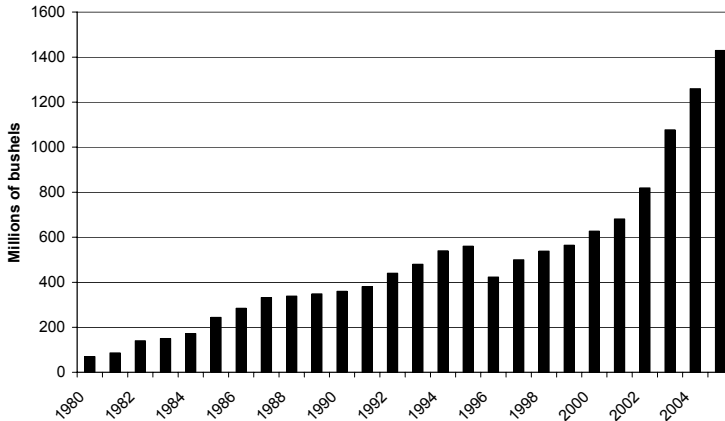


Figure 2. Corn Utilized in Ethanol Production in the United States (source: National Corn Growers Association as cited in Renewable Fuels Association, 2006b)

Ethanol Production in Canada

The ethanol industry in Canada is significantly smaller than in the United States. There are eight commercial ethanol plants in Canada with a total production capacity of 615 million litres per year (Ethanol Producer Magazine, 2006). Two plants currently under construction will add 250 million litres to production capacity upon completion (Ethanol Producer Magazine, 2006).

Three of the Canadian plants use corn as a feedstock and are located in Ontario while the remaining five plants use wheat and are located in Manitoba and Saskatchewan (Ethanol Producer Magazine, 2006). The current capacity of ethanol plants in Ontario is 410 million litres per year. Capacity will increase to 530 million litres when GreenField Ethanol (formerly Commercial Alcohols Inc) brings their third plant online (Ethanol Producer Magazine, 2006).

Currently the capacity of the Prairie plants is half that of Ontario at 205 million litres per year. However, this will increase to 335 million litres once Husky Energy completes the expansion of their plant in Minnedosa, Manitoba (Ethanol Producer Magazine, 2006).

Agra CEAS Consulting and F.O Licht (2006) reported that the Canadian biofuels industry is lagging behind other nations. In 2006, science and technology Trade Commissioner from the Canadian Embassy in Germany,

reiterated this sentiment by reporting that the first generation of the biofuels market is approaching maturity in Germany while Canada's market has barely started (Presser, 2006). The foundations are being built to move Germany's biofuel industry into its second generation where fuel is made from non-food agricultural biomass (Presser, 2006). Despite the European developments the Agra CEAS Consulting report indicates that if the three provincial renewable fuel policies and the federal renewable fuels strategy (5% renewable fuel in transport fuel by 2010) are implemented Canada should be more in line with other biofuel producing nations.

■ Development of the Canadian Ethanol Industry

In December 2005, the federal government announced its goal of having an average of 5% renewable fuel content by 2010. In May 2006, the first meeting between federal and provincial ministers occurred which concluded by establishing parameters for the Renewable Fuels Strategy. As this process moves forward there are some barriers to the biofuel industry's continued development that must be addressed.

US Competition

Although Canada has been producing ethanol for 25 years it is still an emerging industry and has not advanced at the same rate as its US counterpart. US plants have a competitive advantage over Canadian ethanol producers on a number of fronts- subsidies on production, access to financing, perception of business risk and regulatory inefficiency (Canadian Renewable Fuels Association, 2006b). Some of the factors that contribute to Canada's competitive disadvantage are listed below:

- United States Government subsidies: both federal and state support.³
- Accessing financing is more difficult in Canada. Lenders are not familiar with the industry, therefore Canadian projects find it difficult to raise debt and acquire equity⁴.

³ Ethanol Subsidies:

-Federal subsidy (tax forgiveness) of \$US .51/gal authorized until 2010

- Federal small plant subsidy- income tax forgiveness of \$US .10/gal up to 15 million gal. for plant with production < 60 million gal

- Extensive state subsidies to plant. For example, MN subsidy is \$US .13/gal up to 30 million gal

- State tax breaks etc. on property taxes, municipal development fees, etc. Source: Eidman, 2006

⁴ In our view, this is mainly because of the difference in economic feasibility between the US and Canada; if Canadian subsidies matched those in the US, banks would likely be more interested.

- Cost of construction is inflated in many regions of Canada particularly for an industry that requires significant labour input and engineers with specific experience in ethanol plant construction.
- Some plants in the US Midwest burn coal to produce the energy required for the process while Canadian plants use natural gas, resulting in Canadian plants having less impact on the environment via greenhouse gas emissions but paying a higher price for energy (Canadian Renewable Fuels Association, 2006b).

Canadian Wheat Board

The Canadian Wheat Board (CWB) has effects that may influence the development of the ethanol industry in Canada. All ethanol plants that use wheat as a feedstock and produce Dried Distillers Grain Solubles (DDGS) must obtain an export licence to sell DDGS outside of the country. In addition to this hurdle, currently wheat varieties with higher starch content and higher yields that are attractive varieties for ethanol production have been difficult to license under the standards maintained by the Canadian Grain Commission, which are heavily influenced by the CWB (Canadian Renewable Fuels Association, 2006b). The Canadian Grain Commission has conducted consultations and continues to work with farmers regarding the implementation of a new wheat class. Effective August 2008, a new wheat class, known as Canada Western General Purpose (CWGP) wheat will be created and will “provide producers, marketers and customers with access to a wider range of wheat varieties than the current system permits” (Canadian Grains Commission, 2006). New varieties will allow farmers to better supply wheat for industrial markets.

As previously mentioned, Husky Energy has made significant investment in ethanol production from wheat in the Prairie provinces. Currently Husky’s feedstock comes from farmers whose crop does not meet the milling or export wheat standards, traditionally feed wheat (Macafee, 2006). The Canadian Grain Commission is making an initial step to change the wheat grading system. However it needs to be recognized that currently we have three markets for wheat: the biofuels market, the human consumption market and the animal feed market. The wheat grading system and the system of seed varietal approvals is focused on the human consumption segment, to the detriment of the other segments.

Government Policies

The Canadian Renewable Fuels Association has generated a list of measures that they see as being integral to the advancement of the Canadian biofuels industry. An abbreviated list of their recommendations pertaining to ethanol production is listed below:

- Tax incentives and government subsidies:
 - Excise tax exemption for ethanol
 - Tax credit for production
 - Support small producers through refundable tax credit similar to that in the US.
 - Harmonization of Income Tax Act for all renewables - extending the proposed capital cost allowance to ethanol (and biodiesel) plants giving the development of these plants the same capital cost rates as other renewable energy projects.
 - Amending the Income Tax Act to give ethanol (and biodiesel) production facilities the ability to raise equity by the use of flow-through shares giving the industry equivalent standing to that of the oil and gas industry.
- Assistance in commercialization of new technologies (e.g. cellulose ethanol) either through direct capital investment or commercial loan guarantees.
- Investment in research and development to increase the international competitiveness of the Canadian industry.
- Reform the Canadian Wheat Board and Canadian Grain Commission.
 - Remove the need for exporters of DDGS to be approved by the CWB.
 - Remove the requirement that ethanol plants be licensed as elevators in order to purchase grain.
 - Address the barrier to innovation presented by the Grain Commission in regards to new varieties. (Canadian Renewable Fuels, 2006b)

■ Implications for Swine Industry

There is a mixture of positive and negative implications for the swine industry with regard to the development or underdevelopment of the ethanol industry in Canada.

Of initial concern is the pressure being placed on the demand for corn due to majority of ethanol plants in North America using corn as their primary feedstock. This trend has caused the US National Pork Producers Council to voice concern about reduced corn supply and increasing prices. Although the council does recognise that this is a short term issue because the council foresees corn hybrid technology improvements and the by-products of ethanol production becoming more efficient and useful as a swine feed, hence in the long term abating the problem (Farmscape, 2006). In addition to these two potential developments, the ethanol industry globally is moving towards 2nd

generation technology that uses cellulose (corn stover, wheat stalks, grasses and shrubs) as their primary feedstock.

Price of Corn

Due to demand for corn as an ethanol feed stock in the US, the amount of corn used in US ethanol production has almost tripled in 5 years, from 627 million bushels in 2001 to 1,430 million bushels in 2006 (Renewable Fuels Association, 2006b). As mentioned above, the USDA estimates one-fifth of the entire US corn will go into ethanol production in 2006. It is predicted that corn prices will increase due to increased demand for ethanol and this will have an impact on the feedgrains available to the livestock sector. A study conducted by FAPRI (2005) estimates the US Energy Policy Act will increase corn prices an average of 12.5 cents per bushel⁵. All other grains are also projected by the stochastic model to see an increase in average price however the highest average increase is projected in corn.

Higher corn prices due to US ethanol demand will be welcomed by ailing eastern Canadian corn growers. Interestingly, the price effect on Canadian corn (and by extension, feed grains) will occur regardless of Canadian ethanol developments, because of price arbitrage in US and Canadian corn markets. As of this writing, US new crop corn futures are increasing well past the \$US 3.00/bushel level. If this price trend continues, it may induce expansion in Canadian corn acreage, with the prospect of reducing the basis at Canadian points for corn. If ethanol development is pursued in a significant way in Canada, this basis effect is less likely to occur.

Dried Distillers Grains (with Solubles) - A feed supply?

There may be unanticipated side effects of the growth of the ethanol industry on the livestock sector as a whole. Dry distillers grain (DDG) is a much better livestock feed for ruminants than for monogastrics. As mentioned above, the increased production of ethanol may significantly increase the demand for and relative price of corn; consequently the availability and price of DDGs will tend to offer a cost offset to corn prices in feeding ruminants but not in feeding hogs and poultry. Thus, ethanol and its DDG by-product could materially affect the relative competitive balance of Canadian livestock industries with negative consequences for the swine industry.

However not all DDGs are created equal; the dried distillers grains (DDGs) which are a valuable feed for ruminants do not contain the amino-acid profile essential for the swine diet. There has however, been substantial research

⁵ The values presented in the study are the average results for the last five years of the FAPRI's ten-year baseline projections, for crops this is the 2010/11-2014/15 marketing years.

over the last decade which shows that a similar co-product, dried distillers grains with solubles (DDGS) where solubles have been added back in, do contain the amino-acids and are valuable to the swine diet (Shurson, 2005; Stender, 2006). The nutritional value from DDGS varies considerably depending on the process and feedstock used in the ethanol plant. Moreover, it is apparent that contaminants such as fusarium become more concentrated in DDG's, thereby increasing health risk to non-ruminants. Therefore monitoring, testing and further research is required to develop this by-product as a stable input for swine production.

The DDG/DDGS issue presents something of a dilemma for Canada with respect to livestock. If ethanol production grows in Canada, as it has in the US, distillers' grains will be supplied in the Canadian market, and the prospect exists that DDG/DDGS will be available in Canada at prices comparable to that in the US. However, in order for that to occur, it is very likely that the corn/feed grain basis at Canadian points will also increase, which is a competitive disadvantage to livestock users. Conversely, if Canada does not pursue ethanol development as the US has, the corn/feed grain basis appreciation is unlikely to occur, but then DDG/DDGS will be more available in the US than in Canada. This stands to put Canada at a cost disadvantage on the protein component of feed rations by approximately freight over US prices.

Ethanol from Cellulose

Canadian companies Iogen Corporation and SunOpta are at the leading edge of cellulosic ethanol production and globally, there is significant research money going into advancing this technology. Richard Branson, the British entrepreneur, has pledged \$3 billion over 10 years for research into cellulosic ethanol and other biofuels. The world's second largest oil company BP PLC has earmarked \$1 billion to be split evenly between research and venture financing and the US Energy Department has allocated more than \$400 million in funding for ethanol related research and development (Oneal, 2006).

Iogen Corp. located near Ottawa has a demonstration plant that converts cellulosic biomass to ethanol. The company in conjunction with researchers at Purdue University are on the leading edge of cellulosic-ethanol technology and are discovering enzymes that will release the sugars from the complex-carbohydrates within plant cellulose (Oneal, 2006). SunOpta is already implementing commercial cellulosic production of ethanol at a plant located in Spain (SunOpta, 2006).

Once this technology becomes commercially viable the demand on grains from the biofuels industry is likely to be reduced, assuming that current plants can and will eventually convert their technology to cellulosic production.

■ Conclusion

Under current technology and economic conditions in the Canadian market the expansion of the ethanol industry is likely to place pressure on the swine sector due to rising grain prices.

To relieve this pressure, further research and methods of evaluating the nutritional quality of DDGs need to be perfected, the regulatory functions of the Canadian Wheat Board and Canadian Grain Commission need to be rationalized to facilitate ethanol development, and further investment and development of 2nd generation ethanol production is required.

Short term focus should be on development of DDGs as a reliable feed supply for monogastrics and reform of the Canadian Wheat Board to allow for a symbiotic relationship between the ethanol industry and the swine sector. In the long term the development of cellulosic ethanol production will allow grain to return to its traditional uses and the grain producer to reap an added harvest from the crop.

Finally, development of an ethanol industry needs to be considered as a strategic choice for Canada. Ethanol development in Canada is not needed to drive up prices received by corn growers, although such development will increase the basis for Canadian corn and feed grains. From the swine industry perspective, the development of an ethanol industry will mitigate a competitive disadvantage relative to the US in the protein segment of feeds; the cost will be the maintenance or increase in the basis for corn and feed grains in Canada.

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