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CANADIAN FARM FUEL AND FERTILIZER: PRICES AND EXPENSES

July 10, 2009

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CANADIAN FARM FUEL AND FERTILIZER: PRICES AND EXPENSES

The cost of fuel and fertilizers represented about 16% of farm operating expenses in Canada in 2007. Prices of fuel for farm machinery in Canada increased in 2008, but are forecast to decline in 2009. Fertilizer prices reached record highs in 2008, but are forecast to drop in 2009. This issue of the Market Outlook Report examines the situation and outlook for farm fuel and fertilizer prices and expenses in Canada for 2008-2009.

SUMMARY

Figure 1 shows the components of 2007 Canadian farm operating expenses. Fuel and fertilizer costs accounted for 16% of total Canadian farm expenses, or $5.4 billion (bln). For every one cent per litre increase in fuel prices, Canadian farmers' annual machinery fuel bill increases by about $28 million (mln). For fertilizer, every one cent per kilogram increase in the price adds about $66 mln to Canadian farmers' annual fertilizer bill.

After increasing by 38% between 2004 and 2007, farm fuel prices in Canada continued to increase by a further 28% in 2008 due to the strong growth in international demand, ongoing international political uncertainty in the major oil exporting regions such as the Middle East, and tight crude oil supplies. However, the current global economic recession significantly impacts fuel demand and is expected to weaken fuel prices in 2009.

Fertilizer prices in Canada have risen steadily since 2005 but increased sharply to historical highs in 2008, up 64% from 2007. The sharp increase in 2008 was due mainly to continued strong world demand for fertilizer, coupled with significantly higher energy prices and limited fertilizer supplies. Strong world fertilizer demand was supported by favorable crop prices during the first part of 2008, which led to higher global production of grains and oilseeds. Fertilizer prices are forecast to decline in 2009 as a result of falling commodity prices, restricted availability of credit, and rapid and substantial reduction in energy prices.

FARM MACHINERY FUEL

Farm machinery fuel consists mainly of diesel and gasoline, but also includes lubricants. The price of fuel is generally determined by the forces of global supply and demand and the agricultural sector is largely a price taker for both diesel and gasoline.

FUEL PRICES

An unexpected spike-dip pattern occurred with fuel prices during 2008. Fuel prices reached record highs in the first half of 2008 driven by an unprecedented rise in crude oil prices. The high crude oil prices were primarily due to strong world demand attributed to rising economic growth largely in China and India, as well as to substantial US commercial crude oil inventory drawdowns. In the second half of 2008, conversely, fuel prices tumbled upon rapid and substantial reduction of energy demand in the wake of the global economic contraction. However, the fuel market has remained relatively stable since the beginning of 2009. The future direction of fuel prices will largely depend on the nature and depth of the current global economic recession.

The Canadian agricultural sector relies heavily on petroleum to meet a variety of energy needs. Canadian fuel prices follow US energy prices closely. *Figure 2* shows the actual and forecasted energy price pattern in the US and Canada during 2008 and 2009. The West Texas Intermediate (WTI) crude oil price averaged US$100 per barrel in 2008, 38% higher than in 2007.[1] Agriculture and Agri-Food Canada (AAFC) estimated

[1] Estimated by the US Energy Information Administration (EIA) in March 10, 2009.

that the prices paid by Canadian farmers for farm machinery fuel rose by about 28% in 2008 from 2007. This translated into about a $622 mln increase in Canadian farmers' machinery fuel bill for 2008.

The global economic recession, which has depressed world energy demand, is contributing to the weak oil prices. Nonetheless, oil markets are expected to remain relatively stable through most of 2009, until global economic recovery leads to a rebound in energy demand. The EIA projects (March 10, 2009) the price for WTI crude oil to average US$42 per barrel in 2009, down 58% from the 2008 average. Diesel prices are projected to show a 42% decline while gasoline prices are forecast to decrease by 40% in 2009 in the US. Based on the EIA's forecast, AAFC expects that fuel prices for farm machinery in Canada will decrease by about 36% in 2009 compared to 2008. However, if global economic growth rebounds sooner than expected, fuel demand could experience stronger growth and fuel prices could creep higher later in 2009.

FARM FUEL USAGE

Figure 3 illustrates the inverse relationship between fuel price and fuel usage over 1981-2007. For example, fuel usage decreased by 8% when fuel prices increased by 31% in 2000, and fuel usage increased by 7% when fuel prices decreased by 17% in 2002.

Elasticity is a concept used by economists to gauge the responsiveness of demand or supply to changes in price. Using 28 years of historical data from Statistics Canada, the elasticity of demand for the price of fuel in Canada was estimated at -0.16. This means that, on average, when fuel prices rose 10% Canadian farmers reduced fuel usage by 1.6%. Farmers' demand for fuel is relatively insensitive to price changes in the short term because fuel is a necessity for farming and there are no immediate substitutes for fuel.

Figure 4 indicates that farmers' fuel usage was actually quite steady, averaging a 0.5% annual growth rate, with fuel prices fluctuating at around 1.6 of the fuel price index (base year=1980) over the 1981-1999 period. However, the volume of fuel used by farmers decreased by an average of 2% annually over 2000-2007 following a string of continuous hikes in fuel prices after 1999. Therefore, we conclude that although higher fuel prices do have a negative effect on farmers' fuel usage in one year, the increase would have to persist for a longer period of time in order to reduce the fuel consumption trend. In response to higher fuel prices, farmers alter their techniques of production by, for example, choosing more efficient tractors, combines and other farm equipment to reduce tillage, or reducing the number of trips across the field by combining operations to save fuel.

Based on changes to factors such as seeded and harvested area and the fuel price elasticity, AAFC expects Canadian farm machinery fuel usage to remain flat in both 2008 and 2009.

FARM FUEL EXPENSES

Given the change in both price and quantity, Canadian farm machinery fuel expenses are estimated to reach $2.8 bln in 2008, an increase of 28% over 2007 and well above the 2003-2007 average annual expenses of $1.9 bln. Total expenses for farm machinery fuel are forecast to drop by 36% to $1.8 bln in 2009.

FARM FERTILIZERS

Canada is one of the world's major producers of fertilizer, particularly nitrogen and potash. Canada exports about 95% of its potash production and about 50% of its nitrogen products, mainly to the US. Canadian fertilizer production is primarily located in Alberta and Saskatchewan.

FERTILIZER TYPES IN CANADA

Fertilizer contains three key nutrients: nitrogen, phosphate and potash. The nitrogen fertilizers that are currently used in Canadian agriculture mainly include anhydrous ammonia, urea, nitrogen solution, ammonium nitrate and ammonium sulphate. The phosphate fertilizers are monoammonium phosphate (MAP) and diammonium phosphate (DAP), both produced from phosphate rock. The other major nutrient used in crop production is potash fertilizer. Most potash deposits in North America are found in Canada, primarily, Saskatchewan.

Figure 5 shows the usage of major types of fertilizers in Canadian agriculture in 2004 and 2008[2]. Nitrogen fertilizers were the largest nutrient used in agricultural production, accounting for 62% of total fertilizer usage, or about 3.6 million tonnes in 2008. The usage of nitrogen increased by an annual growth rate of 9% from 2004 to 2008, with urea representing the largest volume used. Phosphate fertilizers accounted for 22% of total fertilizer usage, or about 0.9 million tonnes. Potash fertilizer accounted for 16% of total usage, or about 0.6 million tonnes in 2008.

DETERMINATION OF FERTILIZER PRICES

Although other factors have had a significant impact on fertilizer prices in recent years, fertilizer prices are in large part determined by their production costs under normal circumstance. For examples,

Nitrogen

Anhydrous ammonia is the primary component of nearly all the nitrogen fertilizer produced in the world. Ingredients for the production of anhydrous ammonia are air, natural gas and steam. Natural gas accounts for 70-90% of the production cost of ammonia. Therefore, nitrogen fertilizer prices would be expected to be very responsive to changes in natural gas prices. *Figure 6* illustrates that nitrogen fertilizer prices generally track natural gas prices and that higher natural gas prices directly impact nitrogen fertilizer prices.

The correlation between the price of natural gas and the price of nitrogen fertilizer was estimated at 0.82 based on monthly data over 1991-2008. However, this tight relationship did not always hold. For example, in the mid-1990s strong fertilizer demand, in combination with near full industry capacity utilization, kept fertilizer prices high despite low natural gas prices. A similar situation happened during 2007 and 2008. Therefore, when the supply is unable to keep up with the demand, nitrogen prices can react independently of the price of natural gas feedstock.

Phosphate

Three raw materials are required to produce MAP and DAP, namely phosphate rock, sulphur and ammonia. When these material costs are higher, they drive up phosphate fertilizer prices. *Figure 7* describes how increased phosphate rock prices had profound implications on phosphate prices in recent years.

As is the case with fuel, fertilizer is a world-wide commodity and its price is also determined by global supply and demand factors. The world demand for food is rising, driven by growing populations and an increase in demand for meat. This drives up the demand for fertilizer, which is essential in boosting crop yield as a means of increasing production, given the area of productive arable land is decreasing. In recent years, the increased global demand for fertilizer has substantially driven up fertilizer prices. Meanwhile, a tight world fertilizer supply has also played a part in pushing up fertilizer prices, as over the last decade, a small increase in new global production capacity has been more than offset by plant closures. This was particularly the case in North America due to the increasing costs of production, related in large part to the price of natural gas.

In addition, the price of fertilizer at the retail level is also affected by the prices for gasoline and diesel because transportation costs represent part of the cost of marketing fertilizer. Therefore, higher fuel prices can also drive up fertilzer prices through their impact on the transportation component of fertilizer prices at the retail level.

FERTILIZER PRICES

In 2008, the continued strong world demand for fertilizer, supported by intense pressure on global food production and favorable crop prices, and coupled with significantly higher energy prices and limited fertilizer supplies, drove the fertilizer prices to historical highs in Canada. *Figure 8* shows prices of the major types of fertilizer as well as the percentage changes of prices in 2008 as compared to 2007 in Ontario, Manitoba and Alberta. AAFC estimated that the average prices paid for fertilizer in Canada increased by about 64% in 2008 attributed to strong global demand, constrained supply and high energy prices. This 64% increase in fertilizer prices translated into about a $2 bln increase in Canadian farmers' 2008 fertilizer bill.

[2] Usage is based on a fertilizer year (July 1 – June 30).

Nevertheless, a combination of recently falling crop prices and restricted availability of credit as a fallout of the global economic contraction is expected to reduce world fertilizer demand. Consequently, it will induce an easing in the global fertilizer market balance, resulting in price weakness through 2009. Meanwhile, a decline in energy prices will also help to lower fertilizer prices. On the other side, the tight credit market has made farmers cautious and delay purchasing fertilizers to wait for prices to further decline. However, fertilizer suppliers, particularly those who had stocked up with high-priced inventory, have been slow to lower the prices they offer farmers. Based on the information up to March 2009, AAFC forecasts that the average prices paid for fertilizer in Canada will drop by 16% in 2009 compared to 2008. However, the prospect for strong fertilizer demand in early 2009 and the fact that fertilizer producers are operating at reduced capacity for fear of weakened demand could put upward pressure on fertilizer prices during the 2009 planting season.

PRICE COMPARISON IN CANADA AND US BORDER AREA

In fertilizer markets, demand and supply conditions are changing constantly. At any point in time, the price of an old stock of fertilizer or an existing contract may be higher or lower than the actual market price. As a result, fertilizer prices can vary greatly over time and across regions, depending on the local infrastructural endowments, pre-purchase contracts and availability of stocks held by local dealers. In addition, transportation costs, exchange rates and economies of scale can also contribute to price disparities. Therefore, price differences could result from factors other than a lack of market competition. However, economics dictates that market mechanisms prevent prices from deviating too long from their equilibrium in a competitive market.

Data from the Alberta Agricultural Input Monitoring System (AIMS)[3] and AAFC's two farm input price surveys are used to provide the following fertilizer retail price comparisons among regions in Canada and the neighbouring US border area.

Ontario and US border area

Figure 9 presents the fertilizer price comparison between Ontario and the neighbouring US border area in 2008, and statistical test results for selected fertilizers. Average seasonal prices for most of the major fertilizers were lower in Ontario than in neighbouring US states (Michigan, Ohio and Indiana) in 2008. Except for anhydrous ammonia, the average prices for urea, mono-ammonium phosphate and potash were statistically different between Ontario and the US border area in almost all seasons of 2008.[4] In other words, there did seem to be some significantly lower prices in Ontario than in the US border area for most of the major fertilizers in 2008. Actually, an overall lower fertilizer price in Ontario compared to the US was estimated to save Ontario farmers about $59 mln in their 2008 fertilizer bill.

Manitoba and US border area

Figure 10 presents the fertilizer price comparison between Manitoba and the US border area in 2008, with statistical test results. Average prices for phosphate and potash were lower in Manitoba than in neighbouring US states (Minnesota and North Dakota) in almost all seasons of 2008. Although average prices for major nitrogen fertilizers were higher in Manitoba in the spring and summer of 2008, they fell below the neighbouring US prices in the fall. The results demonstrate that the average prices for potash were statistically different between Manitoba and the US border area in all seasons of 2008, with the same conclusion for anhydrous ammonia and phosphate in the fall. In other words, there seemed to be some significantly lower prices in Manitoba than in the US border area for some major fertilizers, particularly in the fall of 2008. An overall lower fertilizer price in Manitoba compared to the US was estimated to save Manitoba farmers about $74 mln in their 2008 fertilizer bill.

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[3] Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit.

[4] A nonparametric Bootstrap is used to test the null hypothesis: Canada and US border area have the same seasonal average fertilizer prices in 2008. The Bootstrap is used because the sample size of the surveys is too small to apply the central limit theorem. 1000 simulated samples are generated for this test. When the likelihood is small (e.g. less than the conventional value of 5% for an unlikely event), it implies that it is unusual to see the observed price difference if the populations have the same mean. As a result, we reject the null hypothesis.

Ontario, Manitoba and Alberta

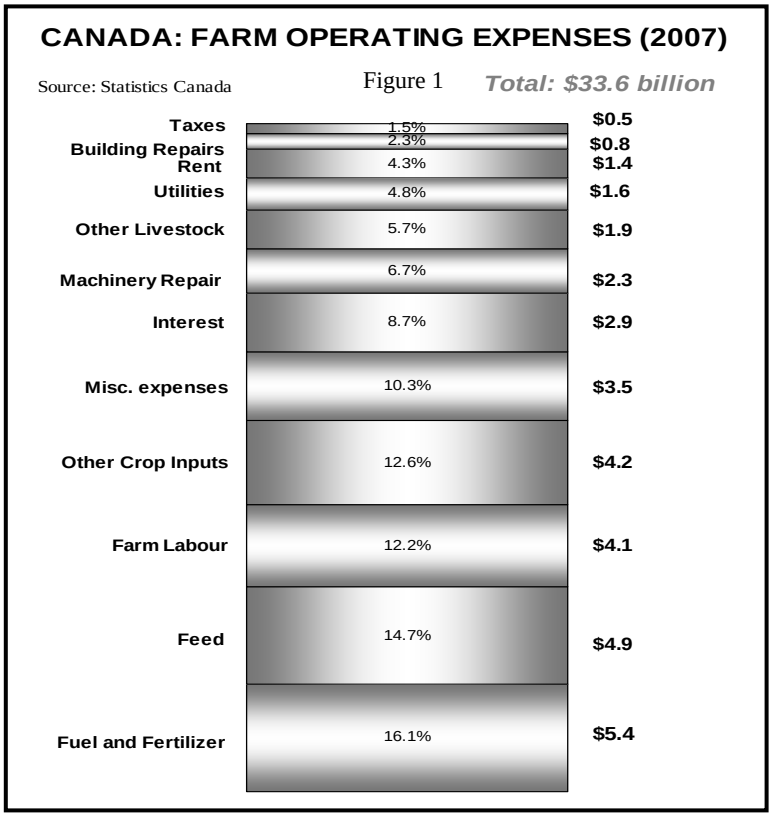
Figure 11 presents a fertilizer price comparison between Ontario, Manitoba and Alberta in 2008. Most of the Alberta and Manitoba fertilizer prices were higher than Ontario prices in the spring and summer, but lower in the fall of 2008. Meanwhile, the price differences between Alberta and Manitoba varied considerably from season to season, with prices ranging from 14.7% higher in Alberta for anhydrous ammonia in the spring to 14.9% lower for urea in the summer of 2008.

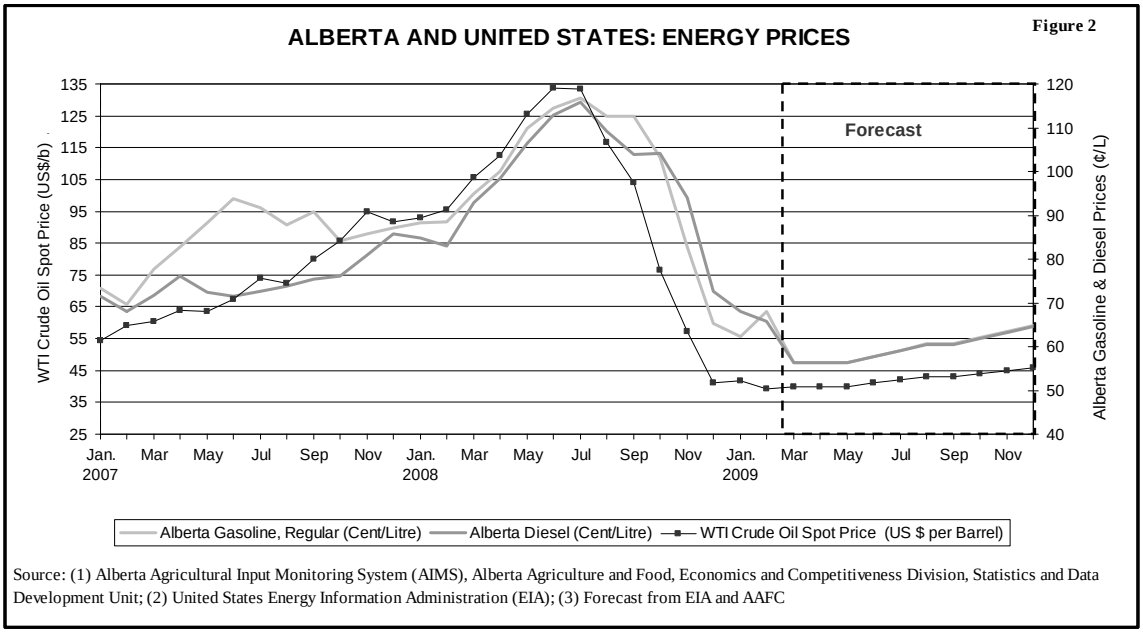
FARM FERTILIZER USAGE

Using 1983-2007 annual historical data, the elasticity for fertilizer demand with respect to seeded area of grain and oilseeds was estimated to be 1.3 in Canada. In other words, on average, a 1% increase in seeded area resulted in a 1.3% increase in fertilizer use. In terms of the estimated elasticity and other factors such as seeded area, fertilizer costs and crop prices, fertilizer usage was estimated to increase by 4% in 2008 and projected to remain flat in 2009 in Canada.

FARM FERTILIZER EXPENSES

Farm fertilizer expenses include all costs associated with the purchase of fertilizer and lime, including application if it is part of the cost. In Canada, when the price and usage changes are considered together, fertilizer expenses were estimated to reach a record $5.4 bln in 2008, an increase of 69% over 2007 and well above the 2003-2007 average annual expenses of $2.6 bln. Fertilizer expenses in 2009 are forecast to drop by 16% from 2008, to $4.5 bln, still well above the recent 2003-2007 average.

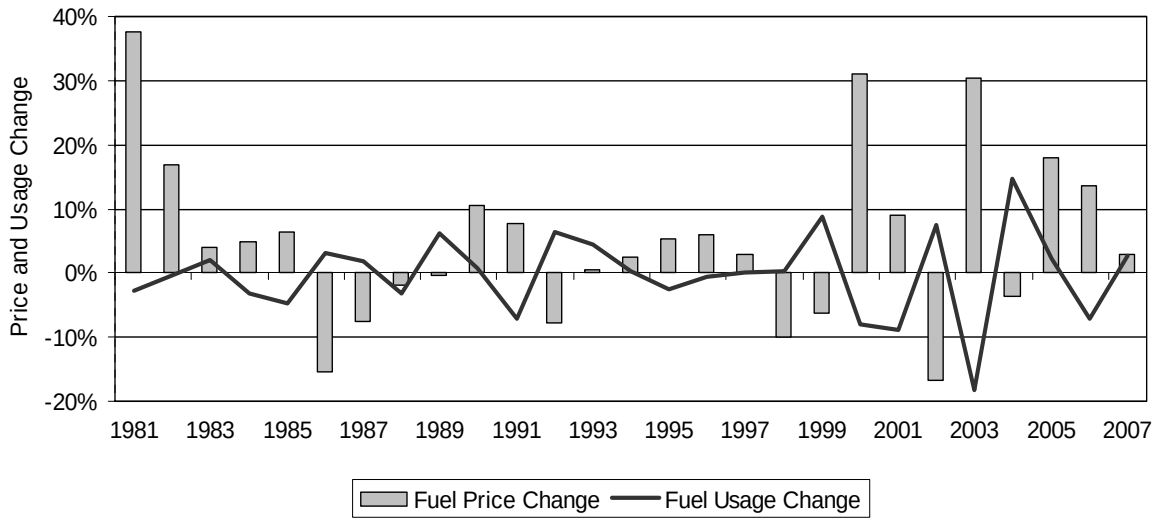




Source: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) United States Energy Information Administration (EIA); (3) Forecast from EIA and AAFC

Figure 3

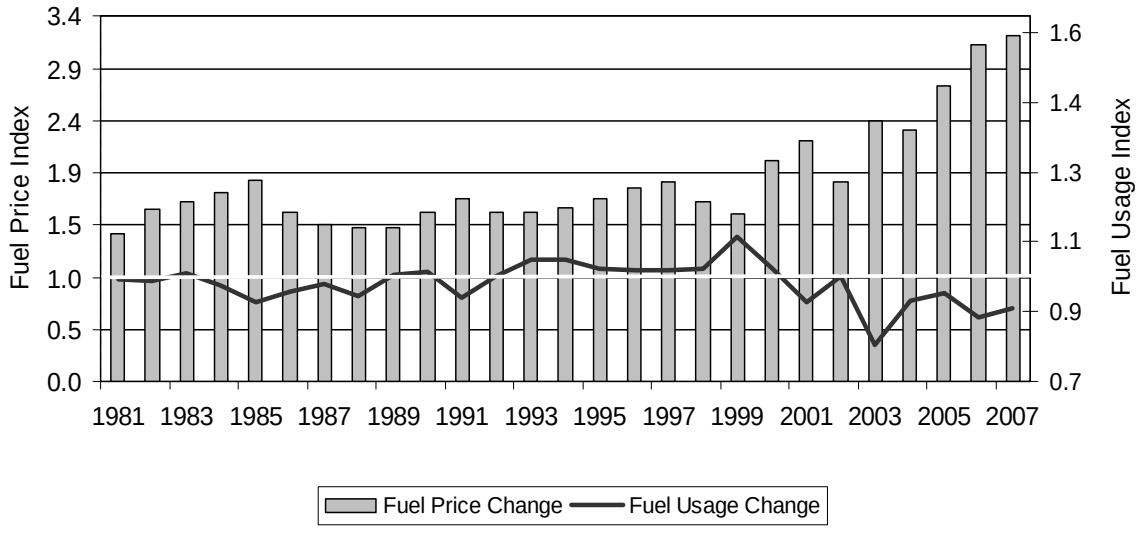
CANADA: FARM MACHINERY FUEL PRICE AND USAGE CHANGES FROM PREVIOUS YEAR



Source: Statistics Canada; Calculations from AAFC

Figure 4

CANADA: FARM MACHINERY FUEL PRICE AND USAGE CHANGES (BASE YEAR=1980)

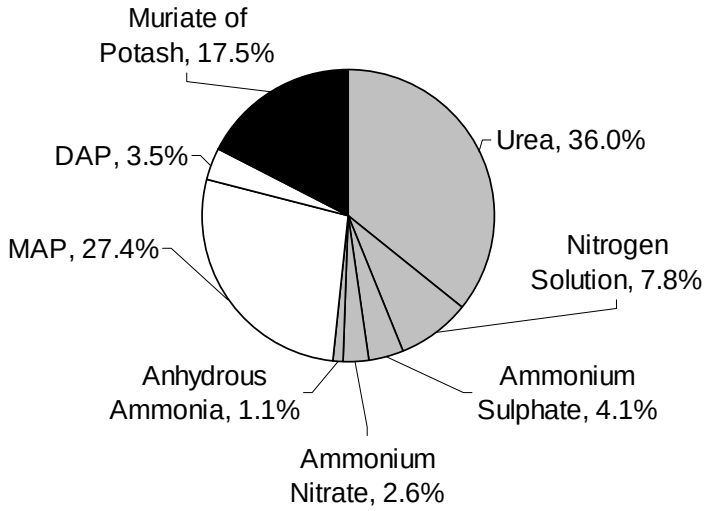


Source: Statistics Canada; Calculations from AAFC

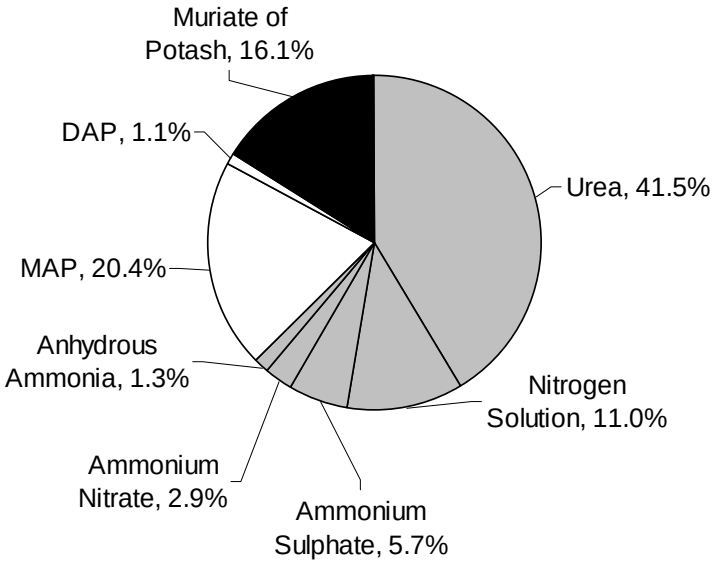
Figure 5

FERTILIZER TYPES AND USAGE IN CANADIAN AGRICULTURE

2004



2008

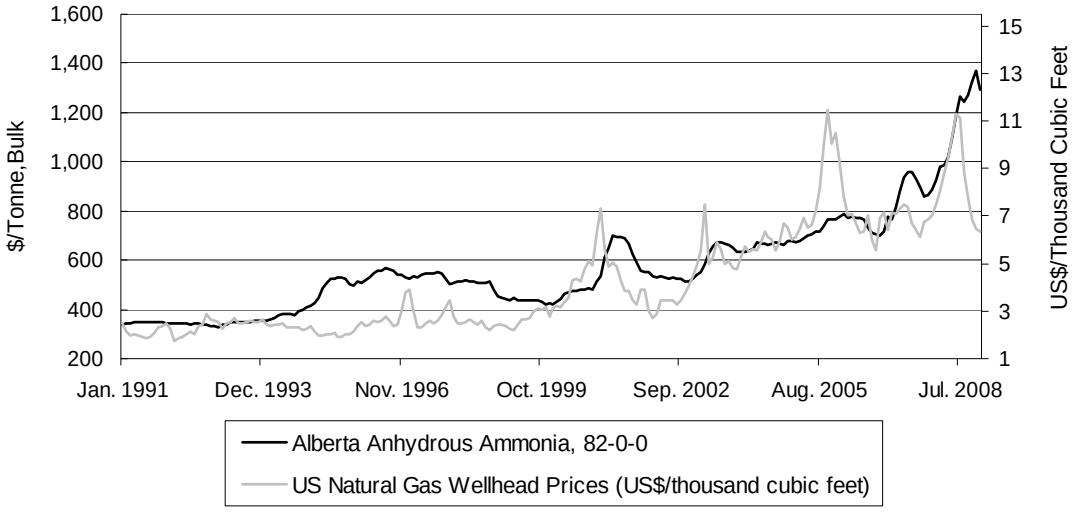


Nitrogen Fertilizer Phosphate Fertilizer Potash Fertilizer

Sources: (1) Canadian Fertilizer Institute; (2) Statistics Canada; (3) AAFC calculations.

ANHYDROUS AMMONIA & NATURAL GAS PRICES

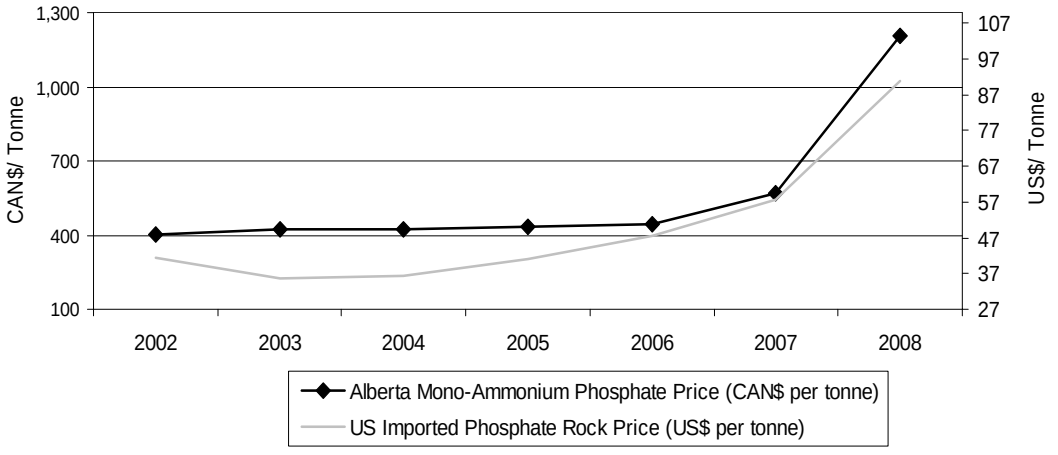
Figure 6



Source: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) United States Energy Information Administration.

Figure 7

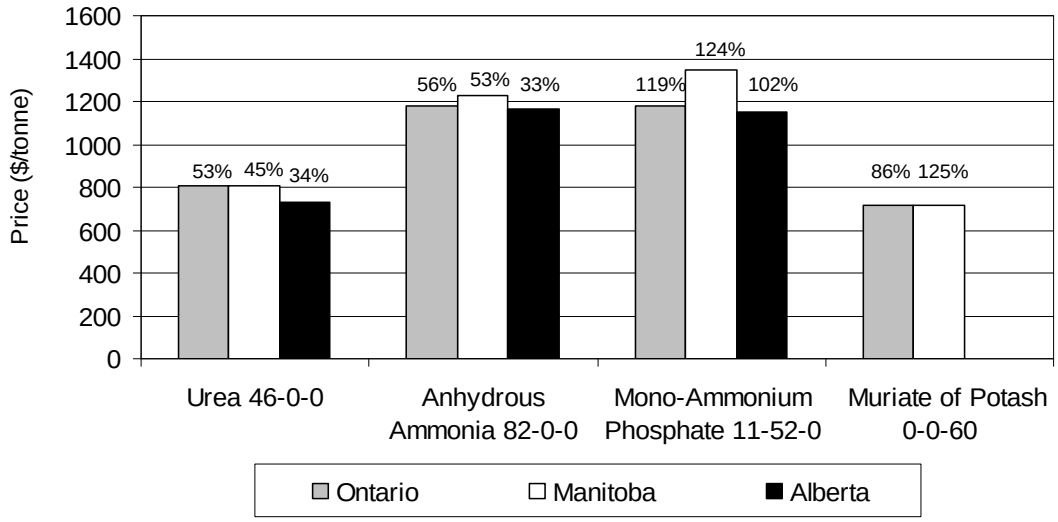
MONO-AMMONIUM PHOSPHATE PRICE & PHOSPHATE ROCK PRICE



Source: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) The United States Geological Survey.

Figure 8

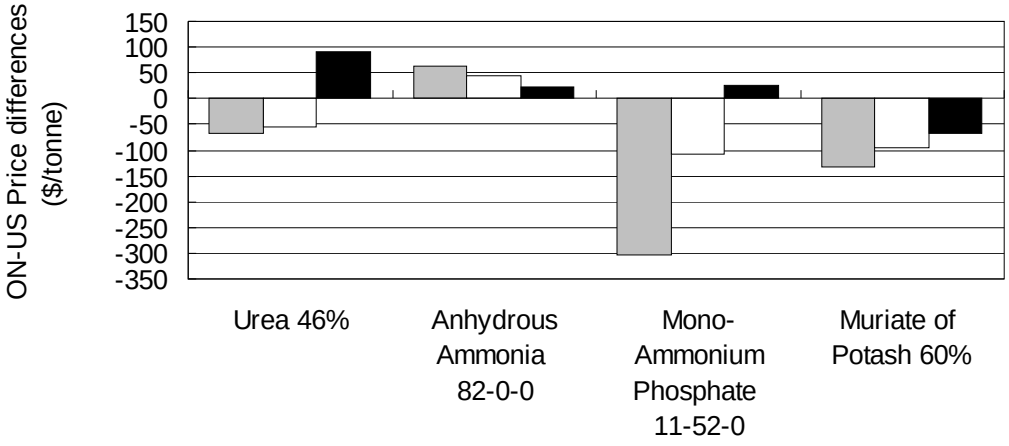
ONTARIO, MANITOBA AND ALBERTA: 2008 FERTILIZER PRICES AND PERCENT CHANGE FROM 2007



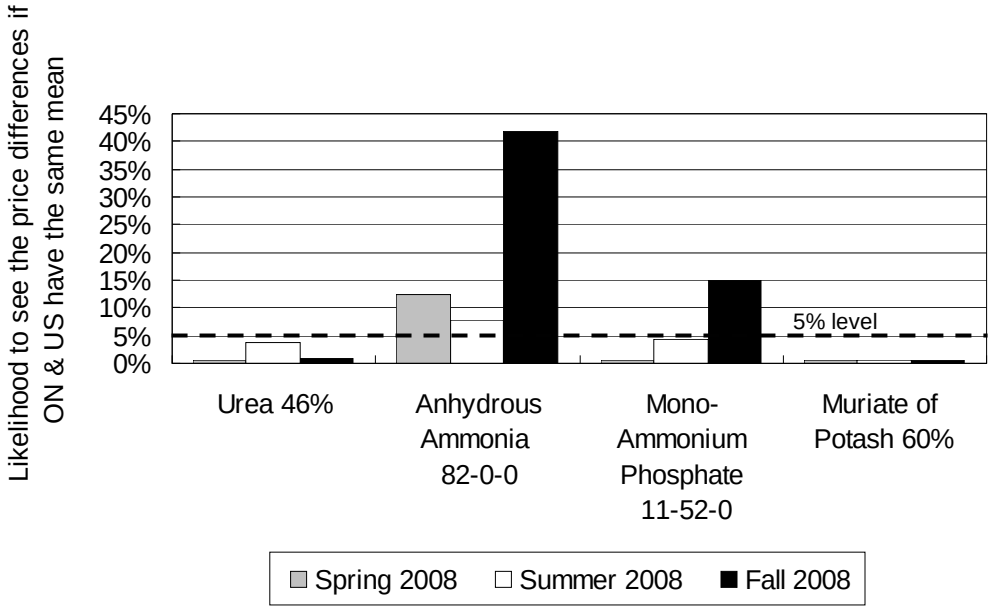
Source: (1) Ridgetown College's farm input price survey; (2) The Thomsen Corporation's farm input price survey; (3) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit.

Figure 9

PRICE COMPARISON BETWEEN ONTARIO AND US IN 2008



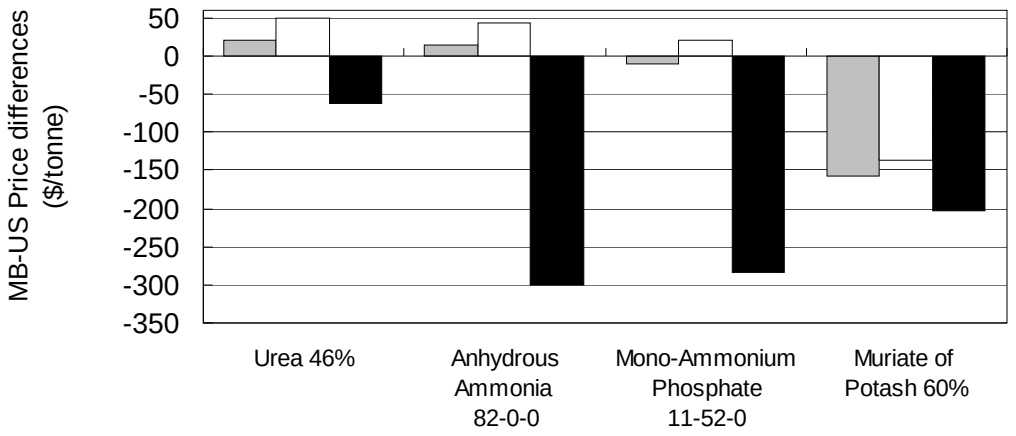
STATISTICAL TEST RESULTS FOR PRICE COMPARISON BETWEEN ONTARIO AND US IN 2008



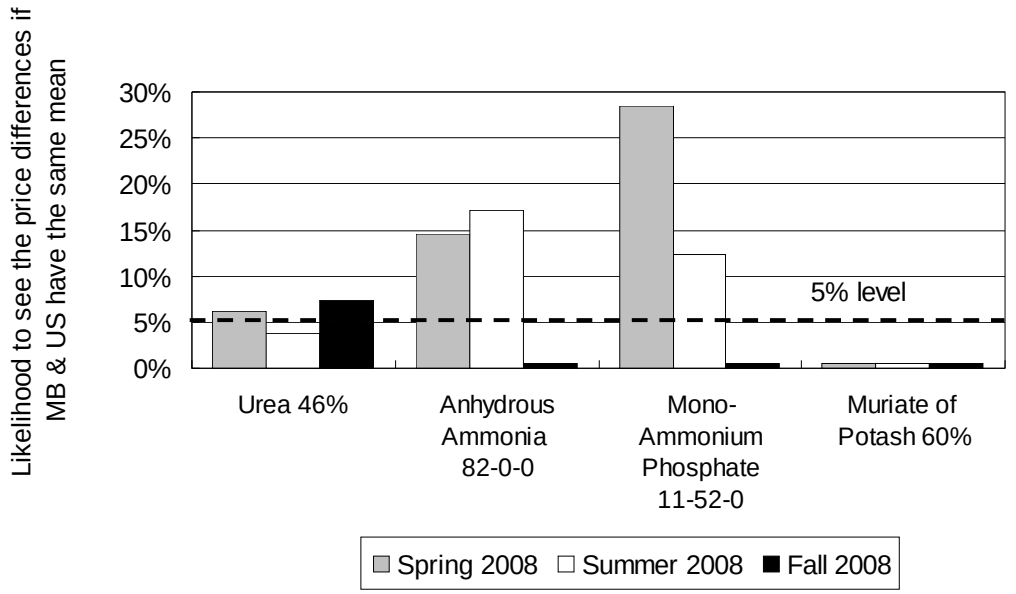
Source: (1) Ridgetown College's farm input price survey; (2) AAFC calculations & tests.

Figure 10

PRICE COMPARISON BETWEEN MANITOBA AND US IN 2008



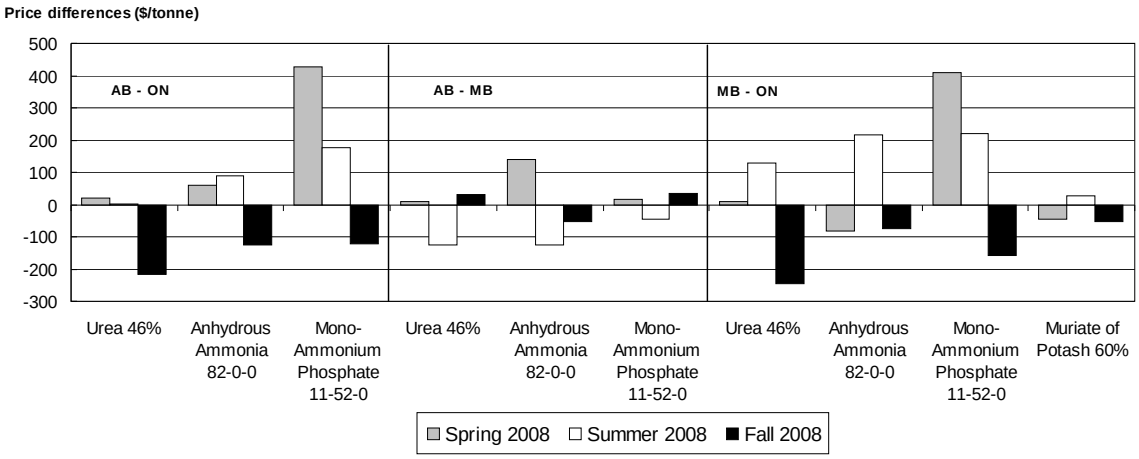
STATISTICAL TEST RESULTS FOR PRICE COMPARISON BETWEEN MANITOBA AND US IN 2008



Source: (1) The Thomsen Corporation's farm input price survey;
(2) AAFC calculations & tests.

Figure 11

PRICE COMPARISON BETWEEN ONTARIO, MANITOBA & ALBERTA IN 2008 FOR SELECTED FERTILIZERS



Source: (1) Ridgetown College's farm input price survey; (2) The Thomsen Corporation's farm input price survey; (3) AIMS, Alberta Agriculture and Food, Economics & Competitiveness Division, Statistics & Data Development Unit; (4) AAFC calculations.