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Prices and Expenses

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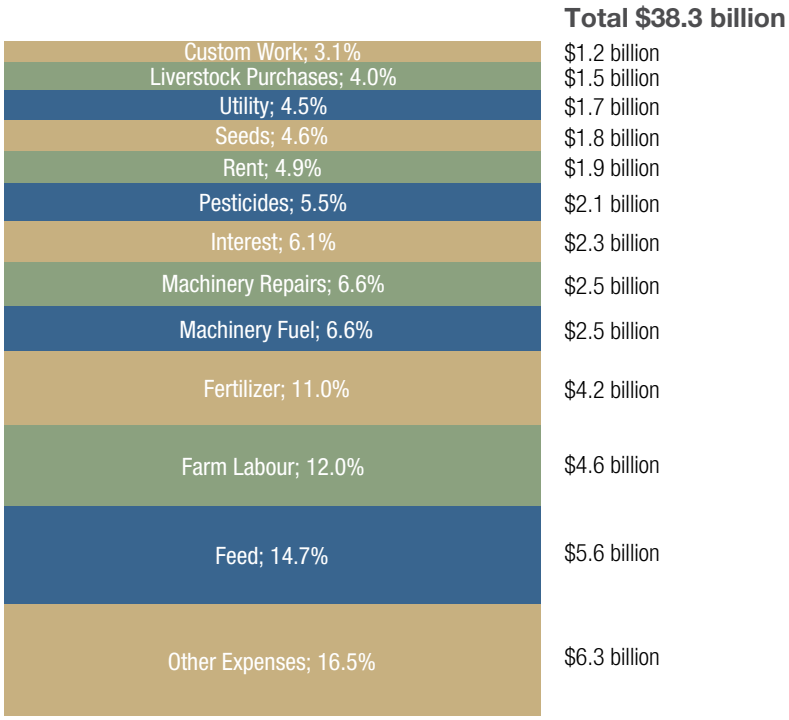
CANADIAN FARM FUEL AND FERTILIZER: Prices and Expenses

This issue of the Market Outlook Report examines the situation and outlook for farm fuel and fertilizer prices and expenses in Canada for 2012-2013. Expenditures for fuel and fertilizers represented about 18% of farm operating expenses in Canada in 2011. Prices of fuel for farm machinery increased in 2012 but are forecast to decline in 2013. Fertilizer prices increased in 2012 and will decrease in 2013.

SUMMARY

Primary production and profitability in the agricultural industry is highly dependent upon fuel and fertilizer. **Figure 1** shows the components of 2011 Canadian farm operating expenses. Fuel and fertilizer costs accounted for 18% of total Canadian farm expenses, or $6.8 billion (bln). For every one cent per litre increase in fuel prices, Canadian farmers' annual machinery fuel bill increases by about $27 million (mln). For fertilizer, every ten dollar per tonne increase in the price adds about $71 mln to Canadian farmers' annual fertilizer bill.

Figure 1_CANADA: FARM OPERATING EXPENSES, 2011



Notes: (1) Rent includes cash rent and share rent. (2) Utility includes electricity, telephone and heating oil. (3) Other expenses include taxes, repairs to building and fences, irrigation, twine & wire, crop insurance premiums, AI & vet, business insurance, stabilization premiums, legal and accounting fee and other expenses.

Sources: (1) Statistics Canada; (2) AAFC calculations.

Fuel prices increased by 123% between 2003 and 2008, but the global economic recession led demand for energy to weaken and fuel prices to fall in 2009. However, fuel prices started to rise again in 2010 and continued this trend over 2011 and 2012. Fuel prices are forecast to decrease moderately in 2013 as a result of lower crude oil prices brought on by increases in US crude oil production and planned new pipeline capacity, combined with flat energy demand.

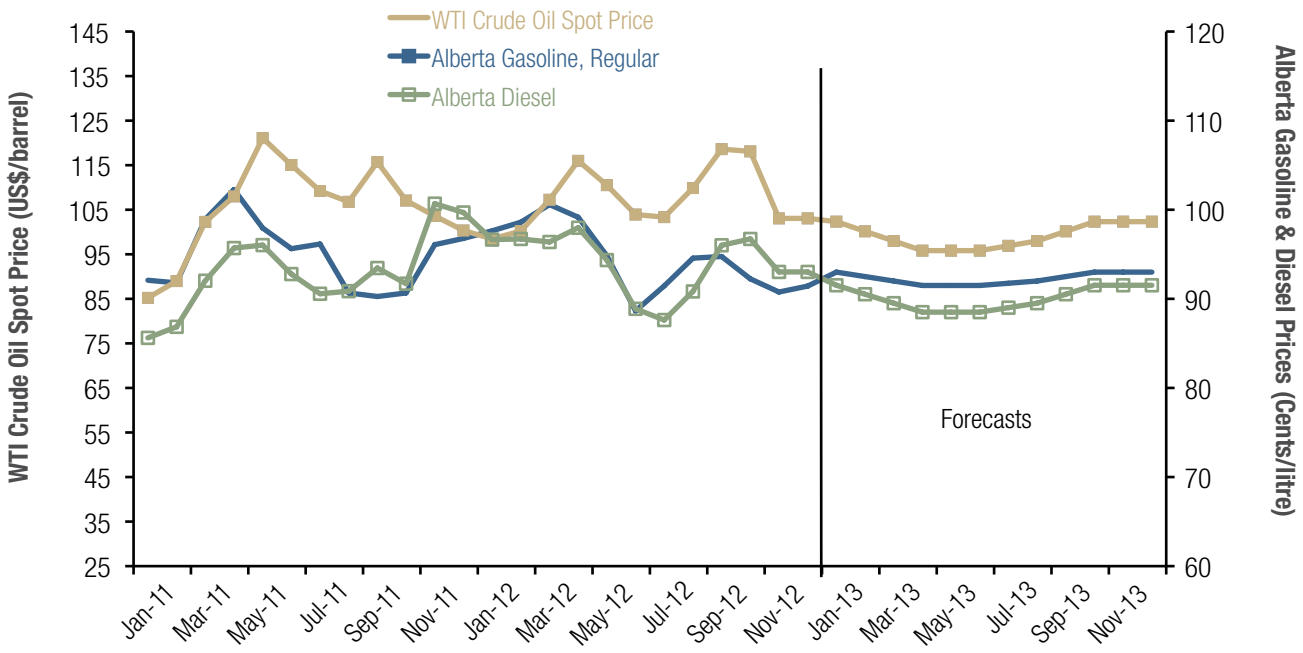
Natural gas supplies have become more plentiful in North America with the development of economical techniques for extracting shale gas, which has kept US and Canadian gas prices depressed in recent years. In 2012, natural gas prices decreased by more than 30% in both the US and Canada. Prices will likely rebound somewhat in 2013, associated with increasing demand and declining production, but will still remain below 2011 levels.

Fertilizer prices in Canada rose steadily starting in 2003, but increased sharply to reach an historical high in 2008. These increases abruptly halted in 2009 as a result of falling commodity prices, restricted availability of credit, and a sudden fall in energy prices. However, fertilizer prices resumed their climb in 2011 and continued to increase in 2012 in response to strong worldwide fertilizer demand driven by high crop prices. Fertilizer prices are forecast to decrease in 2013.

FARM MACHINERY FUEL

Farm machinery fuel expenses consist mainly of diesel and gasoline, but also include 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.

Figure 2_ ENERGY PRICES IN ALBERTA AND UNITED STATES



Sources: (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.

Fuel Prices

The Canadian agricultural sector relies heavily on petroleum to meet a variety of energy needs. Canadian fuel prices closely follow US energy prices. **Figure 2** shows the actual and forecasted energy price pattern in the US and Canada over 2011-2013. The

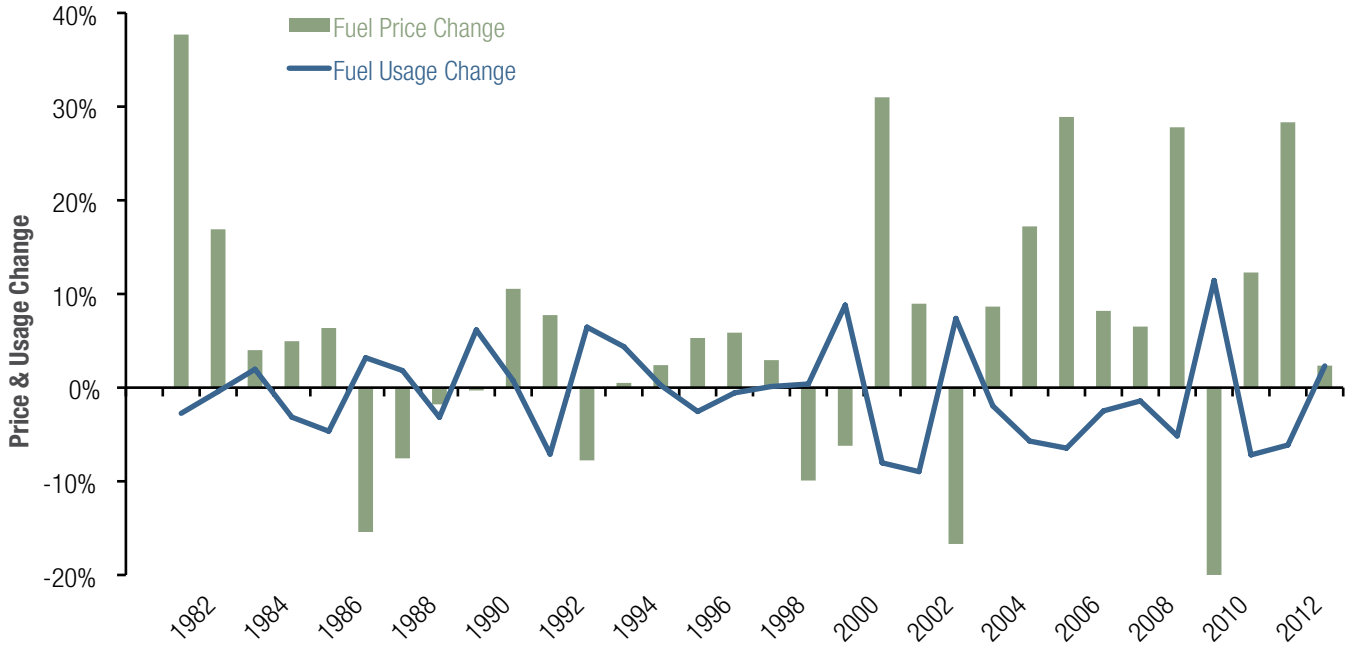
West Texas Intermediate (WTI) crude oil price averaged about US$94 per barrel in 2012, 0.8% lower than in 2011.[1] Agriculture and Agri-Food Canada (AAFC) estimates that the prices paid by Canadian farmers for farm machinery fuel increased by 1.5% in 2012 from 2011. This translated into a $40M increase in Canadian farmers' machinery fuel bill for 2012.

Fuel prices are expected to be lower in 2013 due to weak world energy demand, increases in crude oil production and planned new pipeline capacity in the US. The US Energy Information Administration (EIA) projects the price for WTI crude oil to average US$90 per barrel in 2013, down 5% from the 2012 average. Diesel and gasoline prices in 2013 are projected to decrease by 3% and 5% in the US[2], respectively. Based on information available up to December 2012, AAFC expects that fuel prices for farm machinery in Canada will decrease by about 4% in 2013 compared to 2012. However, energy price forecasting is highly uncertain, as it is critically impacted by global economic changes and geopolitical risks.

Farm Fuel Usage

Price elasticity of demand measures the percentage change in quantity demanded resulting from a percentage change in price. Using 32 years of historical data from Statistics Canada, the price elasticity of demand for farm fuel in Canada is estimated at -0.24. This means that, on average, when fuel prices rise 10% Canadian farmers reduce fuel usage by 2.4%. 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. **Figure 3** illustrates the inverse relationship between fuel price and fuel usage over 1981-2012.

Figure 3 _CANADA: FARM MACHINERY FUEL PRICE AND USAGE CHANGE FROM PREVIOUS YEAR



Sources: (1) Statistics Canada and AAFC; (2) AAFC calculations.

Figure 4 indicates that before 2000, farmers' long-term fuel usage was actually quite steady, averaging a 0.5% annual growth rate, with no significant variability in fuel prices. However, the volume of fuel used by farmers decreased by an average of 2.5% annually following a string of continuous hikes in fuel prices over 2000-2012. Therefore, although higher fuel prices may reduce farmers' fuel usage in any given year, the increase would have to persist for a longer period of time in order to reduce the fuel

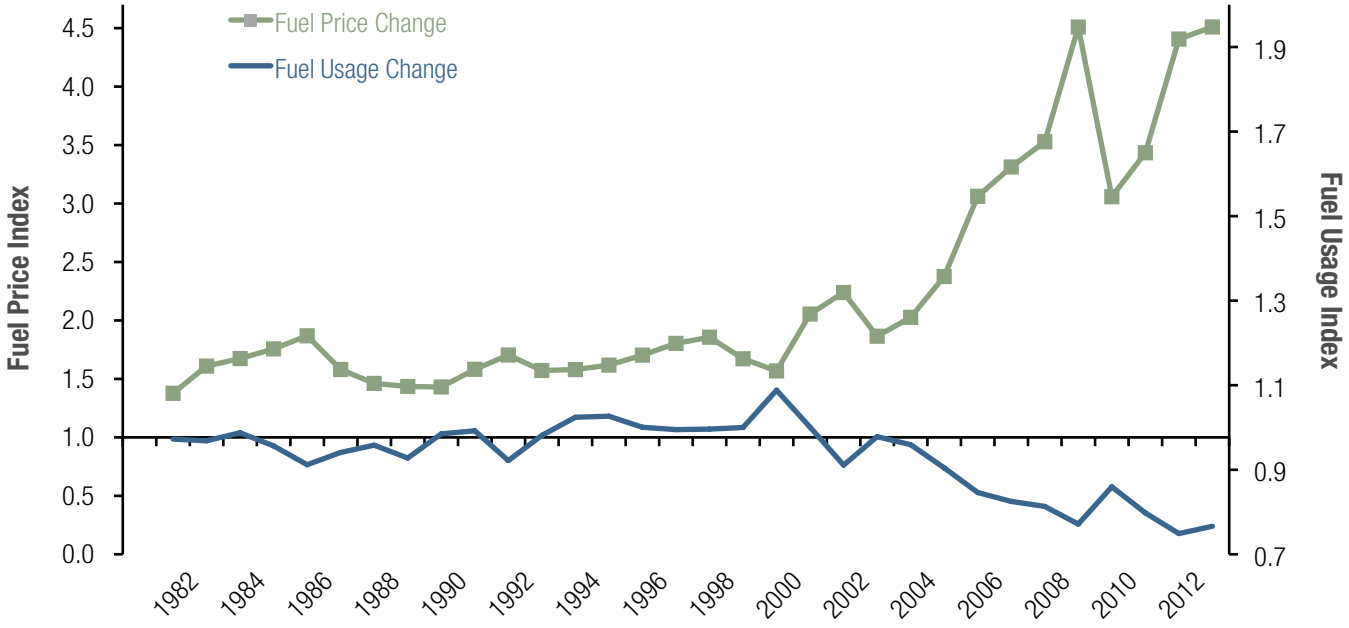
[1] Estimated by the US Energy Information Administration (EIA) in February, 2013.

[2] EIA, February 2013.

consumption trend. In response to higher fuel prices, farmers have altered their production practices by, for example, choosing more efficient tractors, combines and other farm equipment to reduce tillage, or reducing the number of passes across fields by combining operations to save fuel. Conservation tillage, now widely adopted throughout the prairies, is a good example of a more recent practice that is fuel-reducing as well as providing other economic and environmental benefits.

Given the estimated elasticity and other factors such as seeded and harvested area, Canadian farm machinery fuel usage is expected to have increased by 3% in 2012. This is driven by a large area of unseeded acreage in the eastern Prairies that returned to production after flooding in 2011. AAFC projects Canadian farm machinery fuel usage will be flat in 2013.

Figure 4_ CANADA: LONG-TERM TRENDS IN FARM MACHINERY FUEL PRICE AND USAGE (BASE YEAR=1980)



Sources: (1) Statistics Canada and AAFC; (2) AAFC calculations.

Farm fuel expenses

Given changes in both the price and quantity of farm fuels, Canadian farm machinery fuel expenses are estimated to be $2.7 bln in 2012, an increase of 5% over 2011 and above the 2007-2011 average of $2.3 bln. Total expenses for farm machinery fuel are forecast to decrease by 4% to $2.6 bln in 2013.

FARM FERTILIZERS

Canada is one of the world's major producers of fertilizer, particularly nitrogen and potash. Production is primarily located in Alberta and Saskatchewan. In 2011, Canada exported about 59% of its potash production and more than a quarter of its nitrogen production, mainly to the US.

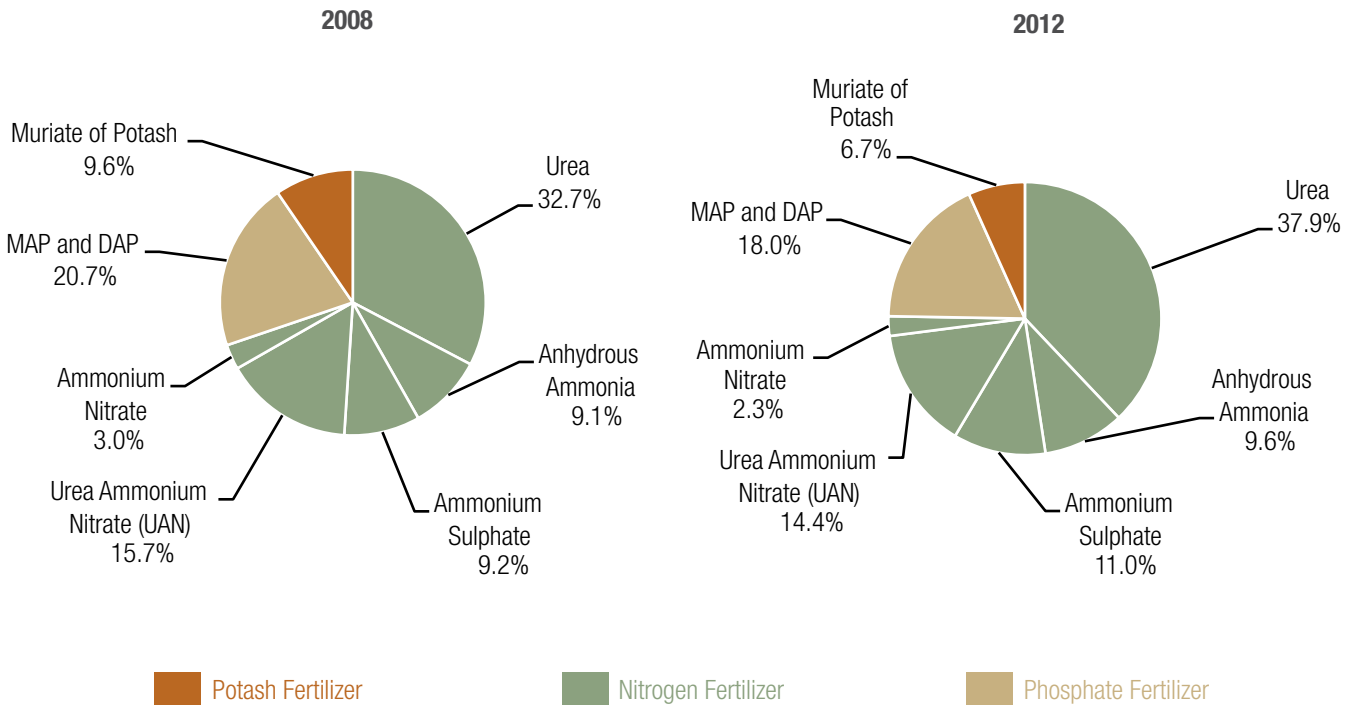
Fertilizer types in canada

Fertilizer contains three key nutrients: nitrogen, phosphate and potassium. The nitrogen fertilizers that are currently used in Canadian agriculture are primarily 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, which is important in soybean and corn production. The majority of potash production in North America is in Saskatchewan.

Figure 5 shows the usage of major types of fertilizers in Canadian agriculture in 2008 and 2012. Because of nitrogen's importance to plant growth and development, nitrogen fertilizers were the largest nutrient used in agricultural production, accounting for 75% of total fertilizer usage, or about 5.2 million tonnes in 2012. The usage of nitrogen increased by an annual growth rate of 7.7% from 2008 to 2012, with urea representing the largest volume used. Phosphate fertilizers accounted for 18% of total fertilizer usage, or about 1.2 million tonnes. Potash fertilizer accounted for 7% of total usage, or about 0.5 million tonnes in 2012.

Figure 5_ CANADA: FERTILIZER TYPES AND USAGE, 2008 AND 2012



Sources: (1) Statistics Canada; (2) AAFC calculations.

Determination of fertilizer prices

The traditional components for determining fertilizer prices are production costs, market demand and competition. However, other factors, such as exchange rates and government policies also have an effect on fertilizer pricing.

Production Costs

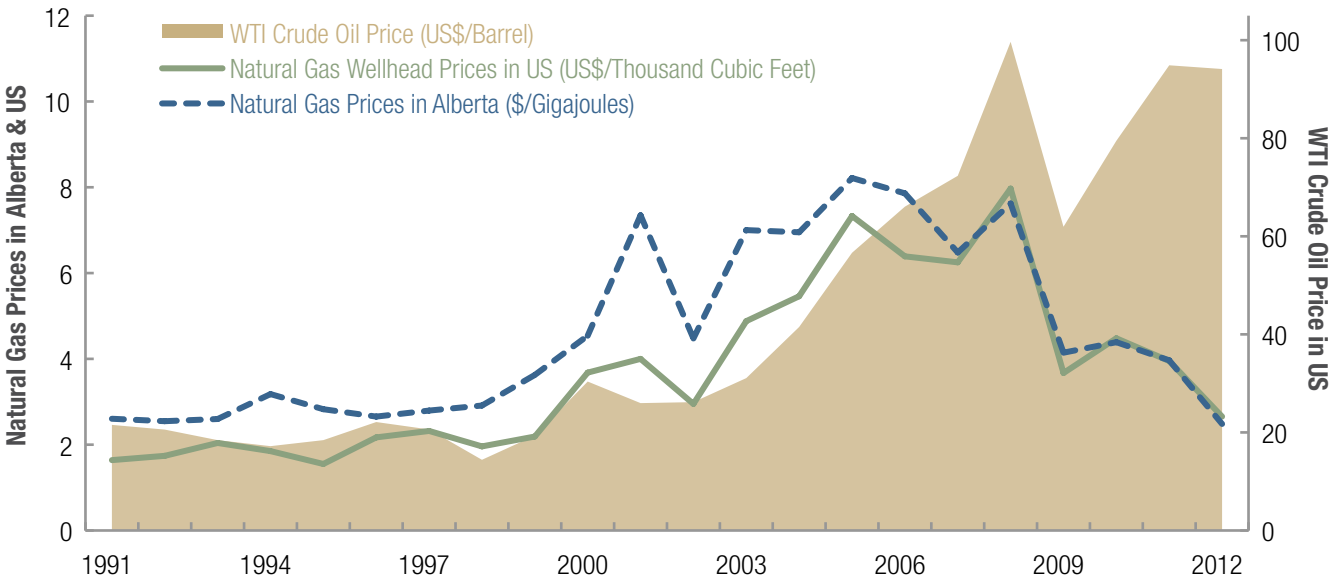
The factors affecting the cost of production for each type of fertilizer are different. The following section will discuss each of the cases for nitrogen, phosphate and potash fertilizers, respectively.

(1) Natural Gas Prices

Anhydrous ammonia is the primary component of nearly all the nitrogen fertilizers produced in the world. Ingredients for the production of anhydrous ammonia are air, natural gas and steam, with natural gas accounting for 70-90% of the production cost of ammonia. Therefore, natural gas prices are one of the major factors to examine in determining nitrogen fertilizer prices.

Figure 6 shows natural gas prices in comparison with crude oil prices in Alberta and the US over 1991-2012. In the past, natural gas and crude oil prices were generally linked, so that changes in the price of oil translated into changes in the price of natural gas. However, the massive gas supply that has resulted from the proliferation of shale gas wells has kept US and Canadian natural gas prices depressed in recent years, causing natural gas and crude oil price decoupling after 2010. The US natural gas Wellhead price averaged only US$2.7 per thousand cubic feet in 2012, 32% lower than in 2011.[3] Similarly, AAFC estimates that the natural gas price in Alberta decreased by 37% in 2012. The US Energy Information Administration (EIA) projects that natural gas prices will likely rebound somewhat in 2013, but will still remain below the 2011 levels.

Figure 6_ NATURAL GAS AND CRUDE OIL PRICES IN ALBERTA AND THE UNITED STATES, 1991-2012



Sources: (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.

Did plunging natural gas prices lead to lower nitrogen prices in recent years? The ammonia-to-gas monthly price change ratio[4] is created to measure whether or not nitrogen fertilizer prices tracks natural gas prices. A ratio equal to 1 means that nitrogen prices track the natural gas prices. A ratio above 1 indicates that nitrogen prices change at a greater pace than natural gas prices, and vice versa. **Figure 7** illustrates that the ratios were mostly within +/- 0.04 of 1 over 1991 to 2006, reflecting that the nitrogen fertilizer price generally tracked natural gas price. However, the two prices series appear to have disconnected after 2006 with most of the ratios swinging away from 1.

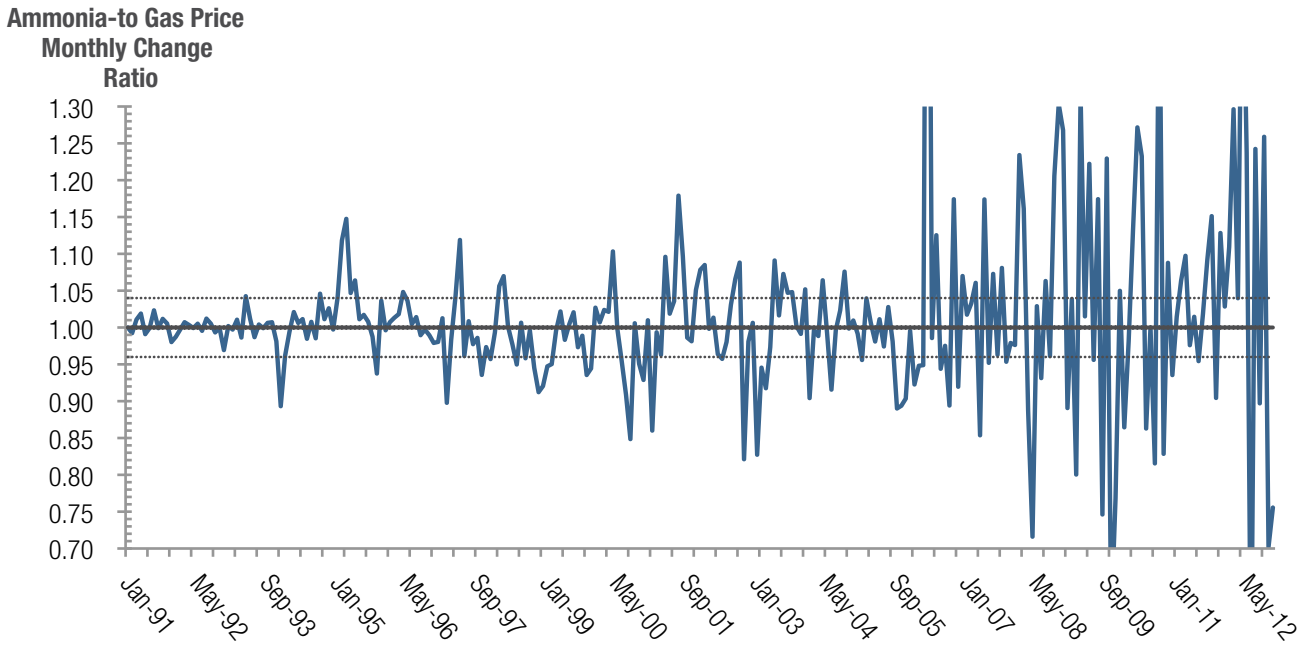
The correlation coefficient is another indicator that is used to measure the degree to which two variables are associated. Values close to ±1 indicate that the two variables are highly related. The estimated correlation coefficients between natural gas prices and fertilizer prices confirm the previous finding, with an estimated correlation coefficient of 0.81 over 1991-2006, but only 0.19 over 2007-2012. Therefore, natural gas prices appear to have less impact on fertilizer prices in recent years than they used to.

Nevertheless, current low natural gas prices, abundant natural gas supplies and solid nitrogen prices have attracted investment in building new fertilizer capacity, restarting closed plants and studying expansions. This will likely put downward pressure on fertilizer prices when these projects come on stream. However, there also may be a host of obstacles, such as environmental issues and long-term financial risks that could make construction of a new site untenable.

[3] Based on information from the US Energy Information Administration (EIA) in February, 2013.

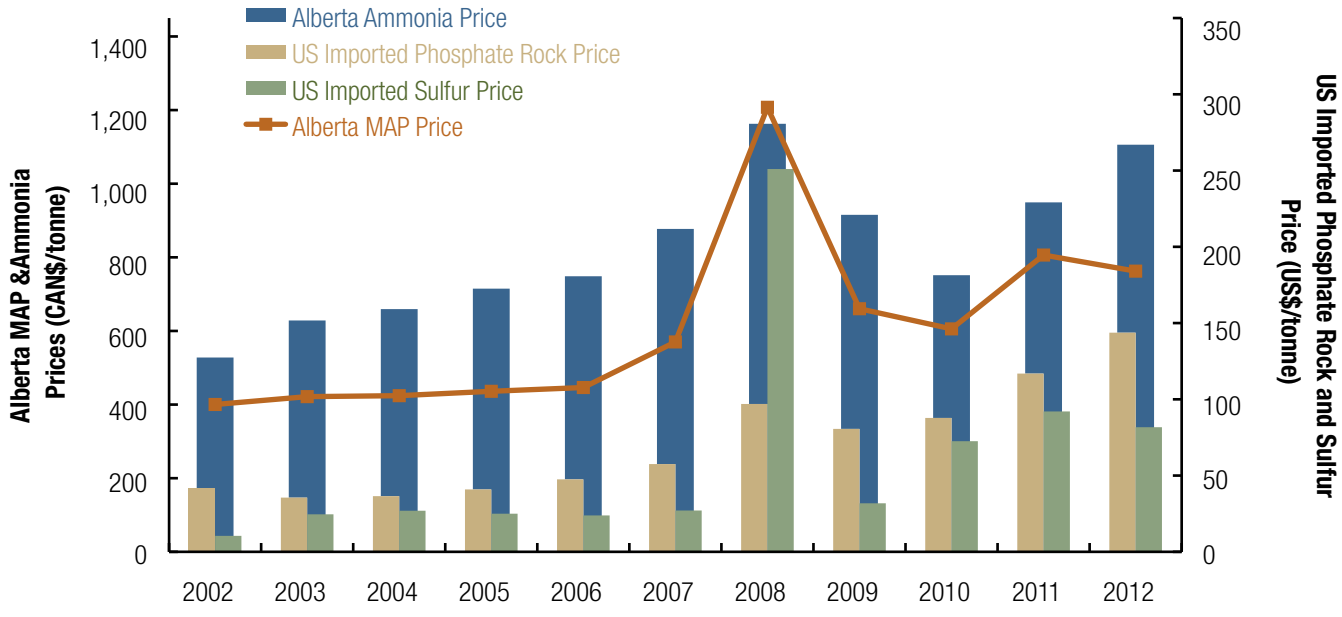
[4] Computed by dividing the monthly change in ammonia price by the monthly change in natural gas price.

Figure 7_AMMONIA-TO-GAS PRICE MONTHLY CHANGE RATIO IN ALBERTA, 1991-2012



Sources: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) AAFC calculations.

Figure 8_ MAP, AMMONIA, PHOSPHATE ROCK & SULFUR PRICES



Sources: (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; (3) US Census Bureau data as adjusted by US Geological Survey and PentaSul North America Sulphur Service; (4) AAFC calculations.

(2) Ammonia, Phosphate Rock and Sulfur Prices

Ingredients for the production of phosphate fertilizers (MAP and DAP) are ammonia, phosphate rock and sulfur. **Figure 8** shows how increased ammonia, phosphate rock and sulfur prices had profound implications on phosphate fertilizer prices over the period 2002-2012. Although the prices of ammonia, phosphate rock and sulfur generally remained flat with no significant variability until 2006, markets began to tighten in 2007 and prices of these raw materials reached a peak in 2008. This dramatic increase in raw material prices significantly drove up phosphate fertilizer prices during 2007 and 2008. However, the increase reversed itself in 2009, resulting in falling phosphate fertilizer prices. After 2010, rising raw material prices pushed up phosphate fertilizer prices again.

(3) Production Costs for Potash

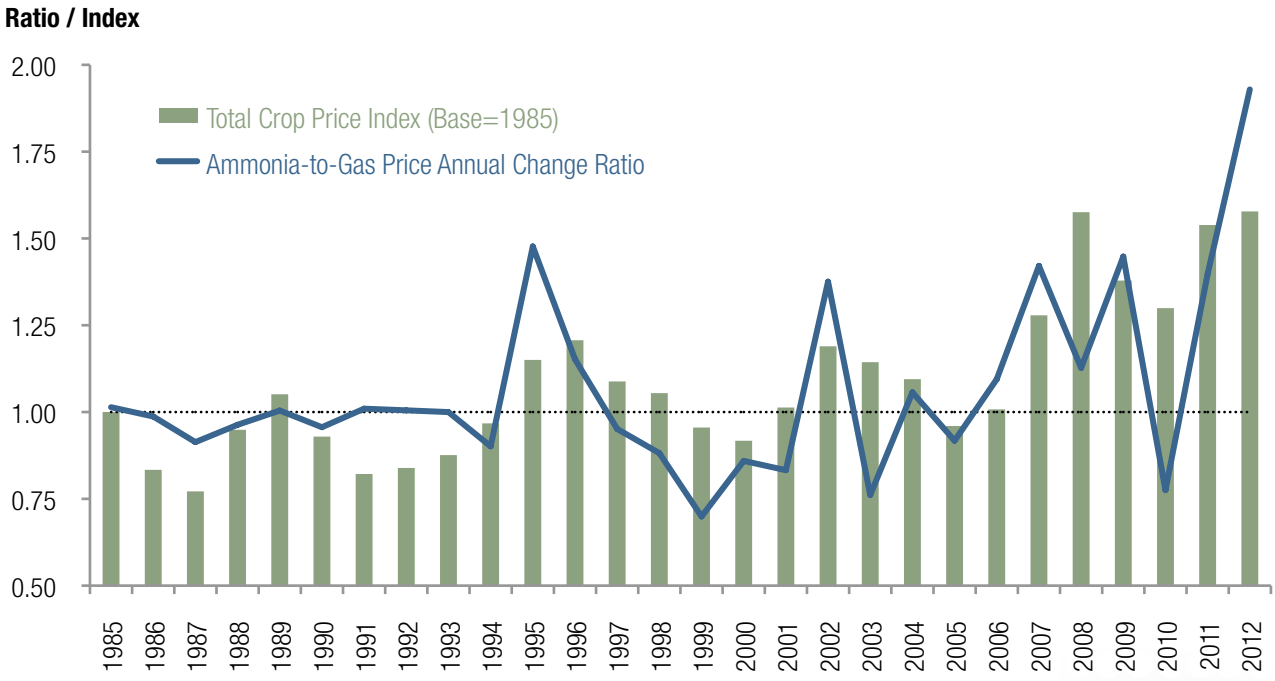
Potash is primarily mined from underground ore deposits. Production costs for potash are generally affected by a mine's geology (such as ore thickness, consistency, continuity, depth and grade), energy and water management costs, the level of mill recovery, operational capacity and the degree of automation.

Besides production costs, prices for all three types of fertilizers at the retail level are also affected by prices for gasoline and diesel because transportation costs represent an important part of the cost of marketing fertilizer.

Market Demand

As in the case of fuel, fertilizers are internationally traded commodities and their prices are determined by global supply and demand factors. The world demand for agricultural commodities is rising, driven by growing populations, increased demand for meat and strong government biofuel initiatives. This rising demand has increased agricultural commodity prices, which has in turn led to higher profit margins for farmers and has enabled them to increase fertilizer usage to boost yields as a means of increasing production. The resulting increased global demand for fertilizer has substantially driven up fertilizer prices. **Figure 9** shows how nitrogen fertilizer prices responded to agricultural commodity prices in Canada.

Figure 9_ AMMONIA-TO-GAS PRICE ANNUAL CHANGE RATIO & TOTAL CROP PRICE INDEX, 1985-2012



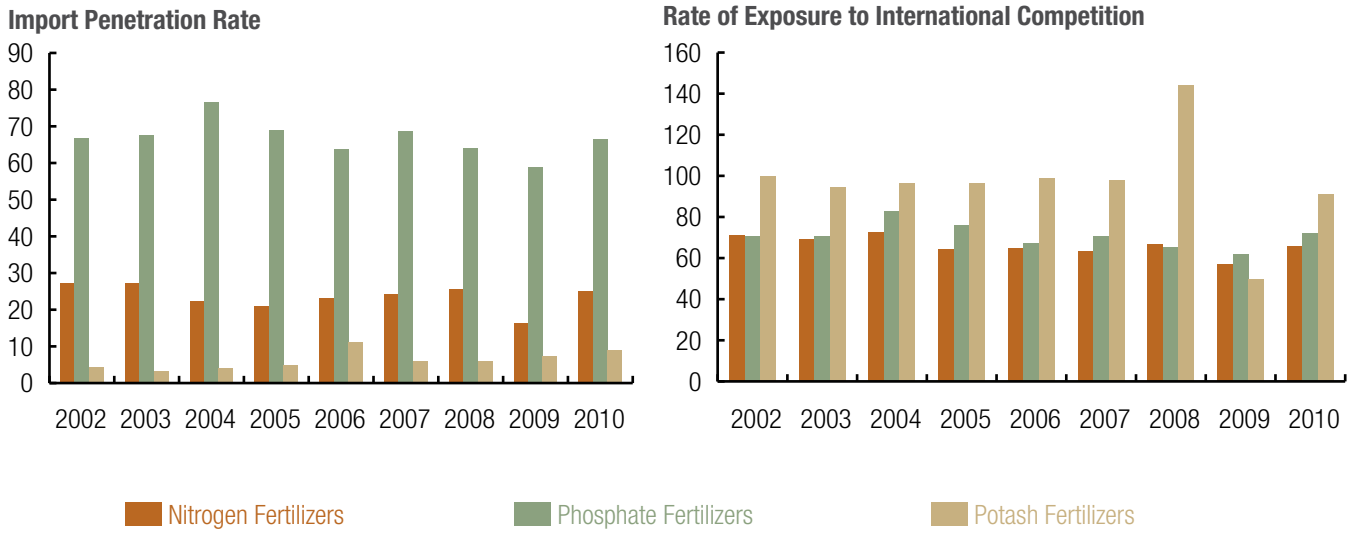
Sources: (1) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (2) Statistics Canada; (3) AAFC calculations.

The increase in the ammonia-to-gas price annual change ratio occurred roughly at the same time the crop price index increased. For example, strong fertilizer demand, driven by high crop prices, kept fertilizer prices high despite low natural gas prices after 2006. A similar situation happened in the mid-1990s. Therefore, although natural gas prices have declined, nitrogen prices can still move higher independently of the price of their natural gas feedstock if supply is unable to keep up with the demand for fertilizer. Obviously, fertilizer prices have been more tied to international demand and supply factors than to natural gas prices in recent years.

Competition

Canada is one of the world's major exporters of fertilizer, but also an important importer. In 2010, Canadian fertilizer exports represented more than half of its production while imports accounted for 32% of domestic fertilizer consumption. The largest portion of Canadian fertilizer exports are destined for the US while most of the fertilizer imports are also from the US. With increasing globalization and market liberalization, Canadian fertilizer production targeted at domestic markets experiences competition from imports. Meanwhile, Canadian fertilizer exports also face international competition in global markets. **Figure 10** presents the measures of exposure to foreign competition for the Canadian fertilizer industry over 2002-2010.

Figure 10_ MEASURES OF EXPOSURE TO FOREIGN COMPETITION FOR THE CANADIAN FERTILIZER INDUSTRY



Sources: (1) Food and Agriculture Organization of the United Nations, FAOSTAT database; (2) AAFC calculations.

Import penetration rates[5] show the high magnitude of foreign competition within the domestic market faced by Canadian phosphate fertilizer producers. Meanwhile, Canadian nitrogen fertilizer producers confront relatively little foreign competition, and potash producers face almost no foreign competition as the domestic market is supplied almost exclusively by domestic production. When domestic and global markets are considered together, the rates of exposure to international competition[6] show that Canadian potash producers are exposed to the highest level of foreign competition, followed by phosphate fertilizer producers.

Canadian fertilizer prices reflect a balancing of several factors. Given foreign competitors within domestic and global markets, Canadian fertilizer suppliers have little choice but to match the world market price in order to establish a market share. However, with high concentration in the Canadian fertilizer industry, there could be upward pressure on prices due to the interdependency among a small number of firms. In addition, the strength of fertilizer export associations, such as the US

[5] Import penetration rate = imports/consumption*100.

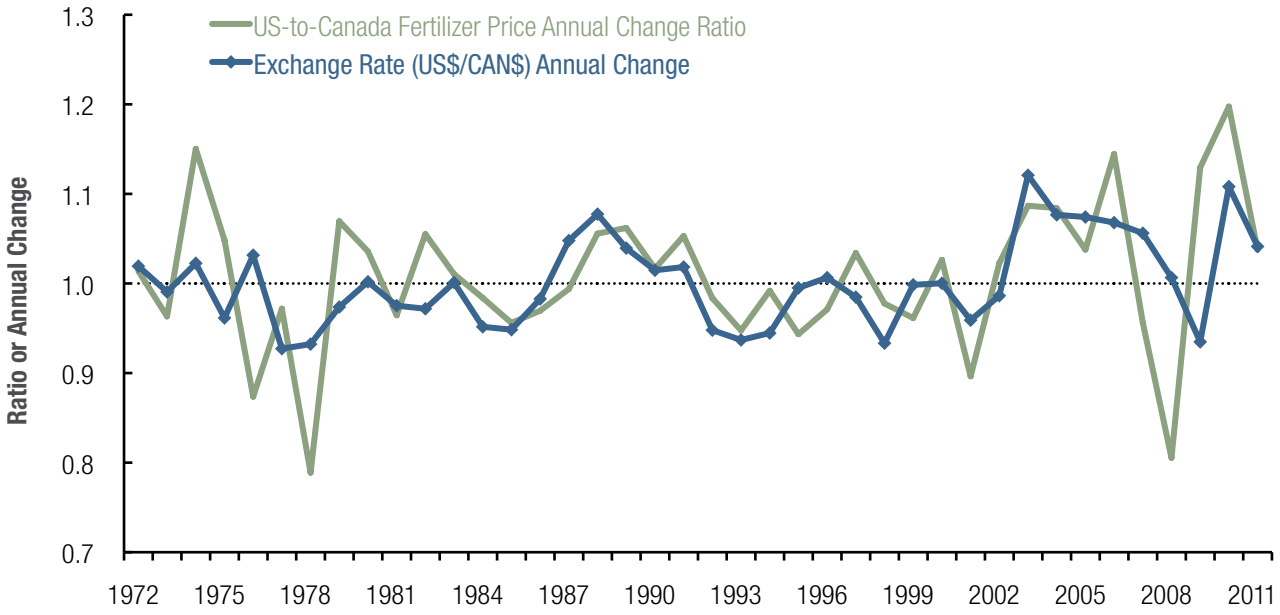
[6] Rate of exposure to international competition = (exports/production + (1-exports/production) * (imports/consumption))*100.

Phosphate Chemical Export Association and CANPOTEX in Canada, the world's largest exporter of potash, also has a strong influence in setting fertilizer prices in global markets.[7]

Other Factors

Canadian dollar exchange rates also have an effect on fertilizer pricing as Canadian fertilizer prices must either rise or decline to the level of import prices to remain competitive. The US-to-Canada fertilizer price annual change ratio[8] is created to show what impact the exchange rate has on fertilizer prices in the US and Canada. **Figure 11** illustrates that Canadian fertilizer prices seem to capture long-run movements in Canadian dollar exchange rates. Apparently, an appreciation of the Canadian dollar has had a beneficial impact on fertilizer prices for Canadian farmers. For example, when the Canadian dollar appreciated over 2003-2006, Canadian farmers made relative savings as fertilizer prices in Canada only increased by 9%, slower than in the US (40%) during this period. Conversely, Canadian farmers paid more for fertilizer purchases when the Canadian dollar depreciated over 1977-1986, as Canadian fertilizer prices rose at a greater pace than in the US (53% in Canada versus 25% in US).

Figure 11_ US-TO-CANADA FERTILIZER PRICE ANNUAL CHANGE RATIO & EXCHANGE RATE ANNUAL CHANGE



Sources: (1) USDA National Agricultural Statistics Service (NASS); (2) Statistics Canada; (3) AAFC calculations.

Besides exchange rates, government trade policies in major fertilizer exporting and importing countries can influence fertilizer prices in global markets. For example, with tight global supplies of fertilizers, higher export tariff rates on urea, di-ammonium phosphate and mono-ammonium phosphate implemented by China in 2008 further tightened the world fertilizer supplies. This likely resulted in higher fertilizer prices than would otherwise had been the case during 2008 and 2009.

[7] Wen-yuan Huang, February 2009, "Factors Contributing to the Recent Increase in U.S. Fertilizer Prices, 2002-08", United States Department of Agriculture.

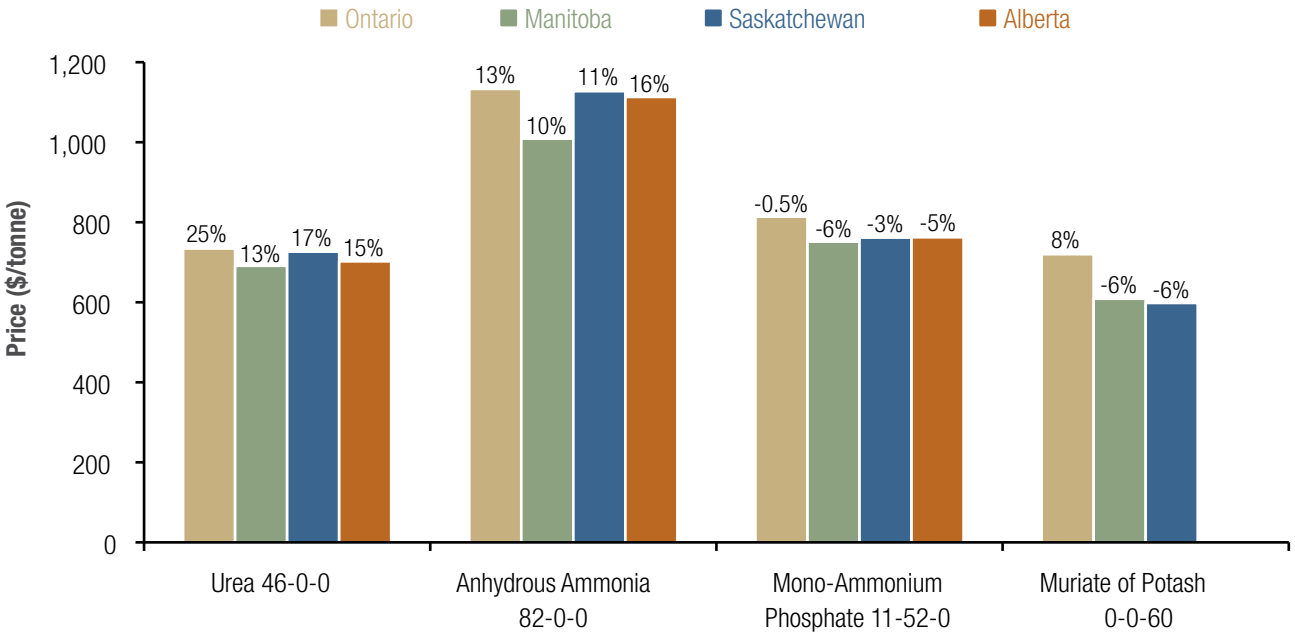
[8] US-to-Canada fertilizer price annual change ratio = US fertilizer price annual change / Canadian fertilizer price annual change. When the exchange rate (US$/CAN$) increases, the US-to-Canada fertilizer price annual change ratio should also rise, reflecting a US fertilizer price translated into a lower Canadian fertilizer price in the domestic market, and vice versa.

Fertilizer Prices

Strong worldwide fertilizer demand due to rising crop prices induced a tightening in the global fertilizer market balance, resulting in price strength through 2012, particularly for nitrogen fertilizers. **Figure 12** shows prices of the major types of fertilizers, as well as the percentage changes of prices in 2012 as compared to 2011 in Ontario, Manitoba, Saskatchewan and Alberta. AAFC estimates that the average prices paid for fertilizer in Canada increased by about 10% in 2012. This 10% increase in fertilizer prices translated into about a $443 mln increase in the Canadian farmers' 2012 fertilizer bill.

In 2013, oversupply in global markets and some reduction in the demand by leading buyers including the US, combined with new production capacity coming on stream, have been driving down fertilizer prices. AAFC forecasts that the average prices paid for fertilizers in Canada will likely decrease about 7.1% in 2013. However, average fertilizer prices could differ significantly from AAFC's current forecast given the volatility of global fertilizer supply and demand, particularly for nitrogen fertilizers.

Figure 12_ FERTILIZER PRICES IN 2012 AND THEIR PERCENTAGE CHANGES FROM 2011 IN ONTARIO, MANITOBA, SASKATCHEWAN AND ALBERTA



Sources: (1) AAFC Farm Input Price Survey; (2) Alberta Agricultural Input Monitoring System (AIMS), Alberta Agriculture and Food, Economics and Competitiveness Division, Statistics and Data Development Unit; (3) AAFC calculations.

Farm fertilizer usage

Using 1981-2010 annual historical data, the elasticity of fertilizer consumption with respect to seeded area of major grain and oilseeds was estimated to be 0.7 in Canada. In other words, on average, a 1% increase in seeded area resulted in a 0.7% increase in fertilizer use. In terms of the estimated elasticity and other factors such as seeded area, fertilizer costs and crop prices, fertilizer usage is estimated to have increased by 3% in 2012 in Canada as a large area of unseeded acreage in the eastern Prairies returned to production after excess moisture conditions in 2011. In 2013, AAFC projects Canadian fertilizer usage will likely be flat as seeded acreage is expected to be similar to 2012 and fertilizer application rates remain unchanged from previous years.

Farm fertilizer expenses

Farm fertilizer expenses include all costs associated with the purchase of fertilizer and lime, including application if it is included in the price paid by a farmer. In Canada, when the price and usage changes are considered together, fertilizer expenses are estimated to have reached $4.7 bln in 2012, an increase of 14% over 2011 and greater than the 2007-2011 average annual expense of $3.7 bln. Fertilizer expenses in 2013 are forecast to decrease by 7.2% to $4.4 bln.