



Agriculture and
Agri-Food Canada

Agriculture et
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MARKET OUTLOOK REPORT

Volume 4, Number 1

CANADIAN FARM FUEL AND FERTILIZER: PRICES AND EXPENSES

March 2012

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Electronic version available at
www.agr.gc.ca/gaod-dco

ISSN 1920-082X
AAFC No. 11727E

The *MARKET OUTLOOK REPORT* series is published by
Grains and Oilseeds Division
Sector Development and Analysis Directorate
Market and Industry Services Branch
Agriculture and Agri-Food Canada
500-303 Main Street
Winnipeg, Manitoba, Canada R3C 3G7
Telephone: 204-983-8473
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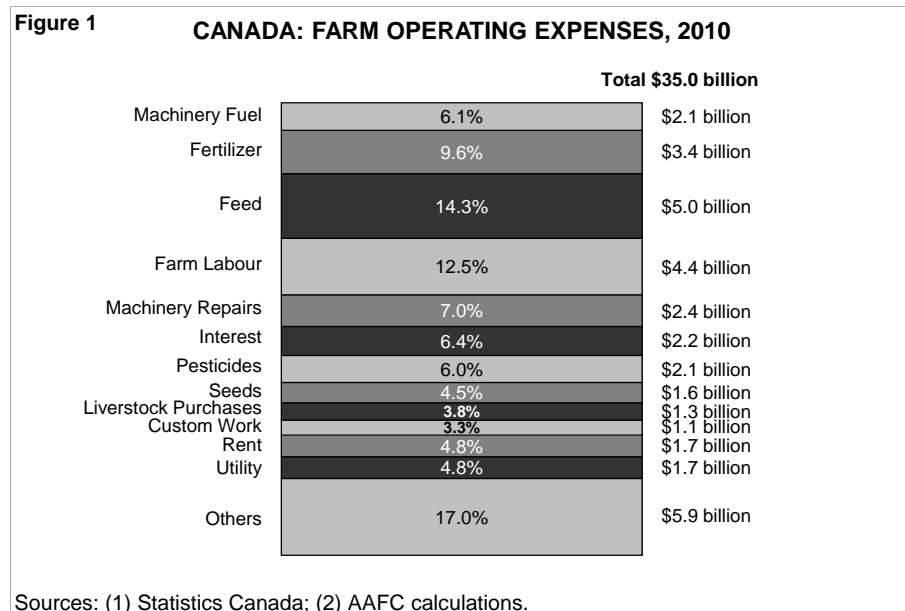
Paru également en français sous le titre
RAPPORT SUR LES PERSPECTIVES DU MARCHÉ
Volume 4, numéro 1
CANADA : ACHATS DE CARBURANT ET D'ENGRAIS DANS LES EXPLOITATIONS AGRICOLES
ISSN 1920-0838
N° AAC 11727F

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 2011-2012. Expenditures for fuel and fertilizers represented about 16% of farm operating expenses in Canada in 2010. Prices of fuel for farm machinery increased in 2011 and are forecast to do so again in 2012. After two consecutive annual decreases, fertilizer prices resumed their climb in 2011 and will continue to rise in 2012.

SUMMARY

Primary production and profitability in the agricultural industry are highly dependent upon fuels and fertilizers. **Figure 1** shows the components of 2010 Canadian farm operating expenses¹. Fuel and fertilizer costs accounted for 16% of total Canadian farm expenses, or \$5.5 billion (G). For every one cent per litre increase in fuel prices, Canadian farmers' annual machinery fuel bill is up by about \$27 million (M). For fertilizer, every one cent per kilogram increase in the price adds about \$61M to Canadian farmers' annual fertilizer bill.



Fuel prices increased by 123% between 2003 and 2008, but the global economic recession caused 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 because of growing energy demand in emerging economies and slowing growth in supply.

¹ (i) Rent includes cash rent and share rent; (ii) Utility expenses include electricity, telephone and heating oil; (iii) Other expenses include taxes, repairs to building and fences, irrigation, twine & wire, crop insurance premiums, artificial insemination fees & veterinary, business insurance, stabilization premiums, legal and accounting fees, and miscellaneous expenses.

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 will continue to increase in 2012 in response to high energy prices and strong

worldwide fertilizer demand driven by rising crop prices.

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.

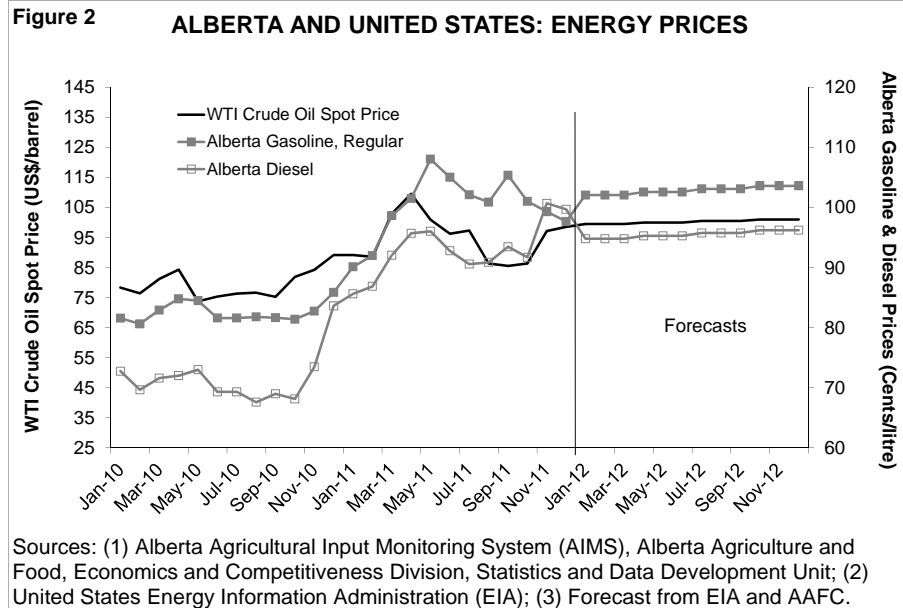
FUEL PRICES

The Canadian agricultural sector relies heavily on petroleum to meet a variety of energy needs. Canadian fuel prices closely follow the US energy prices. **Figure 2** shows the actual and forecasted energy price pattern in the US and Canada over 2010-2012. The West Texas Intermediate (WTI) crude oil price averaged about US\$95 per barrel in 2011, 20% higher than in 2010.² Agriculture and Agri-Food Canada (AAFC) estimates that the prices paid by Canadian farmers for farm machinery fuel increased by 25% in 2011 from 2010. This translated into a \$534M increase in Canadian farmers' machinery fuel bill for 2011.

The oil market is expected to tighten through 2012 due to growing energy demand in emerging economies and slowing growth in supply. The US Energy Information Administration (EIA) projects the price for WTI crude oil to average US\$100 per barrel in 2012, up 6% from the 2011 average. Both diesel and gasoline prices in 2012 are projected to remain at around the same level as in 2011 in the US³. Based on the

² Estimated by the US Energy Information Administration (EIA) in January, 2012.

³ EIA, January 2012.



information available up to January 2012, AAFC expects that fuel prices for farm machinery in Canada will increase by about 3% in 2012 compared to 2011. However, if global economic growth rebounds faster than expected, fuel demand could experience stronger growth and fuel prices could as a result increase more significantly in 2012.

FARM FUEL USAGE

Elasticity is estimated by economists to gauge the responsiveness of demand or supply to changes in the price of a product. Using 30 years of historical data from Statistics Canada, the elasticity of demand for the price of fuel in Canada was estimated at -0.21. This means that, on average, when fuel prices rose 10% Canadian farmers reduced fuel usage by 2.1%. 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 3** illustrates the inverse relationship between fuel price and fuel usage over 1981-2010.

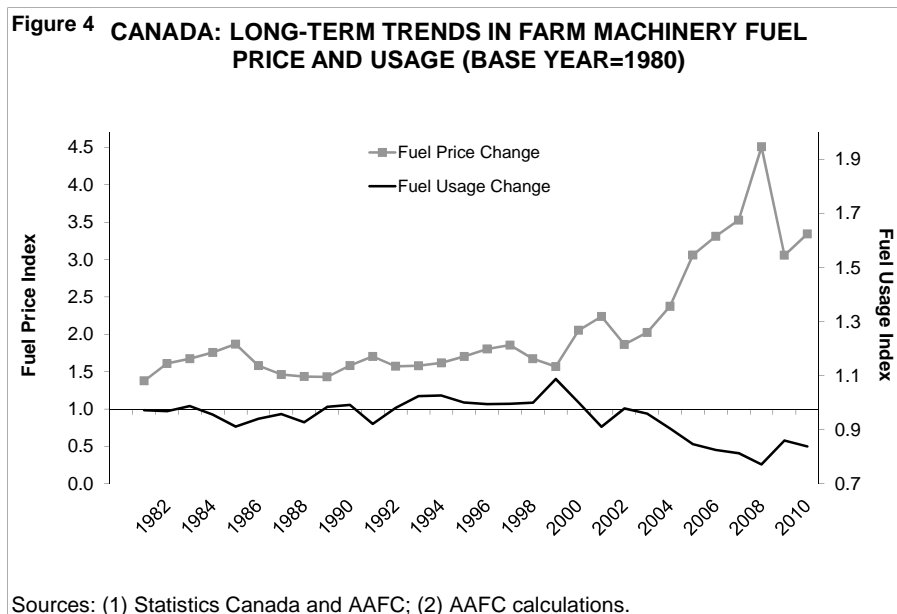
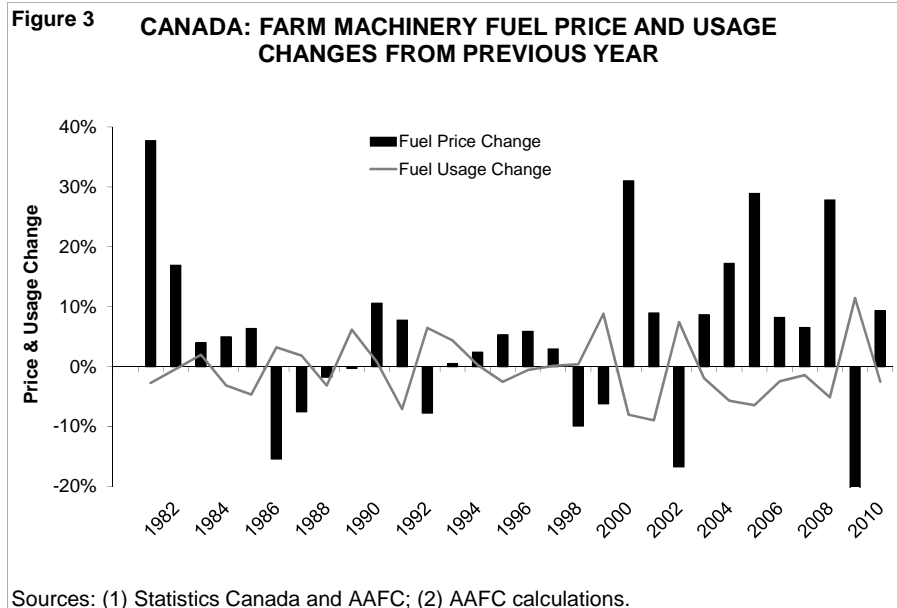
Figure 4 indicates that before 2000, farmers' long-term fuel usage was actually quite steady, averaging a 0.5% annual growth rate, with no significant variability in fuel prices. However, the volume of fuel used by farmers decreased by an average of 2% annually following a string of continuous hikes in fuel prices over 2000-2010. 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 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 passes across fields by combining operations to save fuel.

Given the estimated elasticity and other factors such as seeded and harvested area, Canadian farm machinery fuel usage declined by 3% in 2011. In 2012, AAFC projects Canadian farm machinery fuel usage will increase by 2% as a large area of unseeded acreage due to flooding in the Prairies in 2011 returns to production.

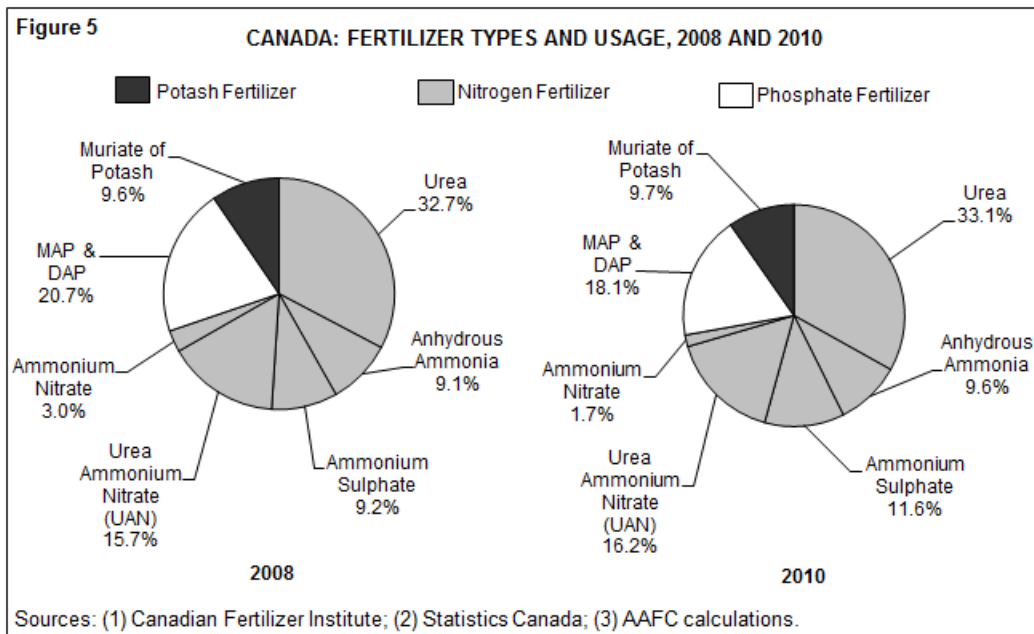
FARM FUEL EXPENSES

Given the change in both price and quantity, Canadian farm machinery fuel expenses were about \$2.6G in 2011, an increase of 21% over 2010 and above the 2006-2010 average of \$2.2G. Total expenses for farm machinery fuel are forecast to increase by 5% to \$2.7G in 2012.



FARM FERTILIZERS

Canada is one of the world's major producers of fertilizer, particularly nitrogen and potash. Canada exports about 84% of its potash production and about a quarter of its nitrogen production, mainly to the US. Production is primarily located in Alberta and Saskatchewan.



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 mono-ammonium phosphate (MAP) and di-ammonium 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 2010. Nitrogen fertilizers were the largest nutrient used in agricultural production, accounting for 72% of total fertilizer usage, or about 4.2 million tonnes in 2010. The usage of nitrogen increased by an annual growth rate of 5% from 2008 to 2010, with urea representing the largest volume used. Phosphate fertilizers accounted for 18% of total fertilizer usage, or about 1.1 million tonnes. Potash fertilizer accounted for 10% of total usage, or about 0.6 million tonnes in 2010.

DETERMINATION OF FERTILIZER PRICES

The traditional components of 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

Anhydrous ammonia is the primary component in nearly all the nitrogen fertilizer 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, 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.

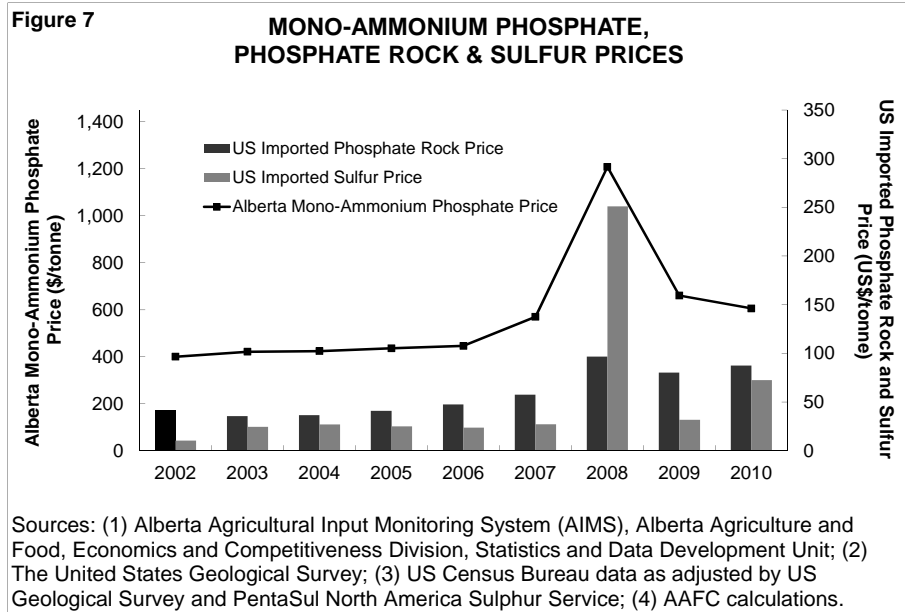
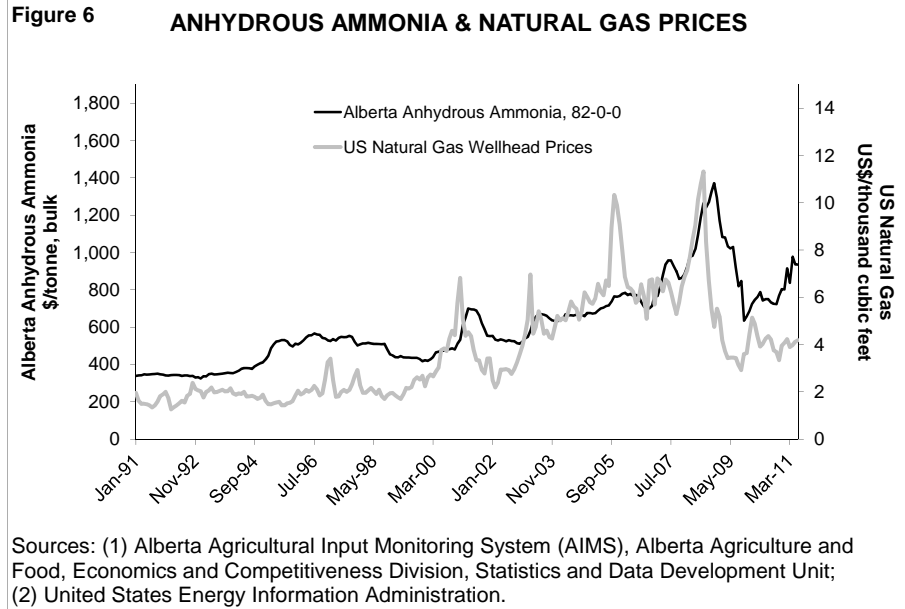
The correlation between the price of natural gas and the price of nitrogen fertilizer was estimated at 0.74 based on monthly data over 1991-2010. However, this relatively tight relationship has not always been the case. For example, in the mid-1990s strong fertilizer demand, in combination with near full industry capacity utilization, kept fertilizer prices high despite low natural gas prices. Therefore, when the supply is unable to keep up with the

demand, nitrogen prices can move independently of the price of their natural gas feedstock.

Ingredients for the production of phosphate fertilizers (MAP and DAP) are phosphate rock, sulfur and ammonia.

Figure 7 shows how increased phosphate rock and sulfur prices had profound implications on phosphate fertilizer prices over the period 2002-2010. Although the prices of phosphate rock and sulfur generally remained flat with no significant variability until 2006, markets began to tighten in 2007 and their prices reached a peak in 2008. This dramatic increase of the raw material price significantly drove up phosphate fertilizer prices during 2007 and 2008. However, the increase reversed itself in 2009, resulting in falling phosphate fertilizer prices.

Besides production cost, the price of fertilizer at the retail level is also affected by prices for gasoline and diesel because transportation costs represent an important part of the cost of marketing fertilizer.

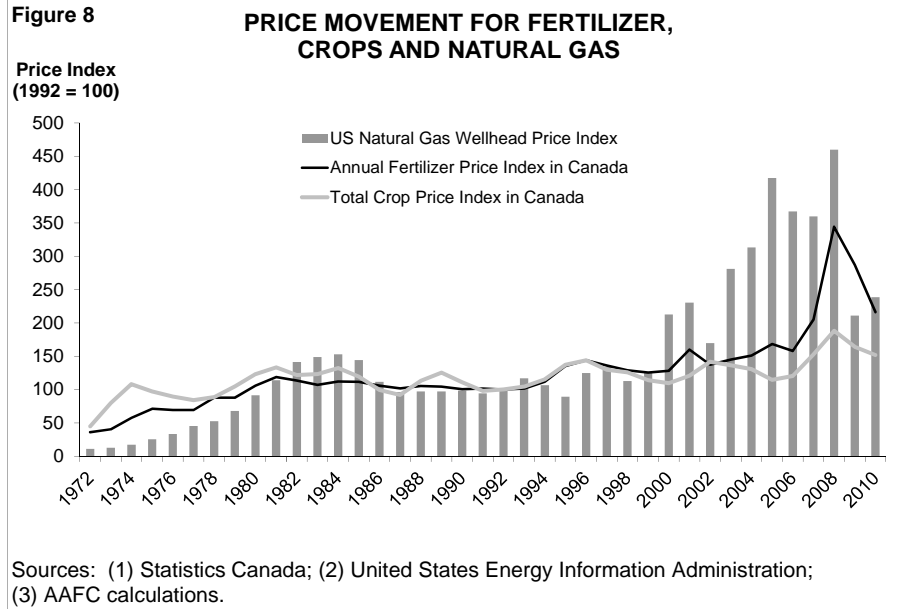


Market Demand

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

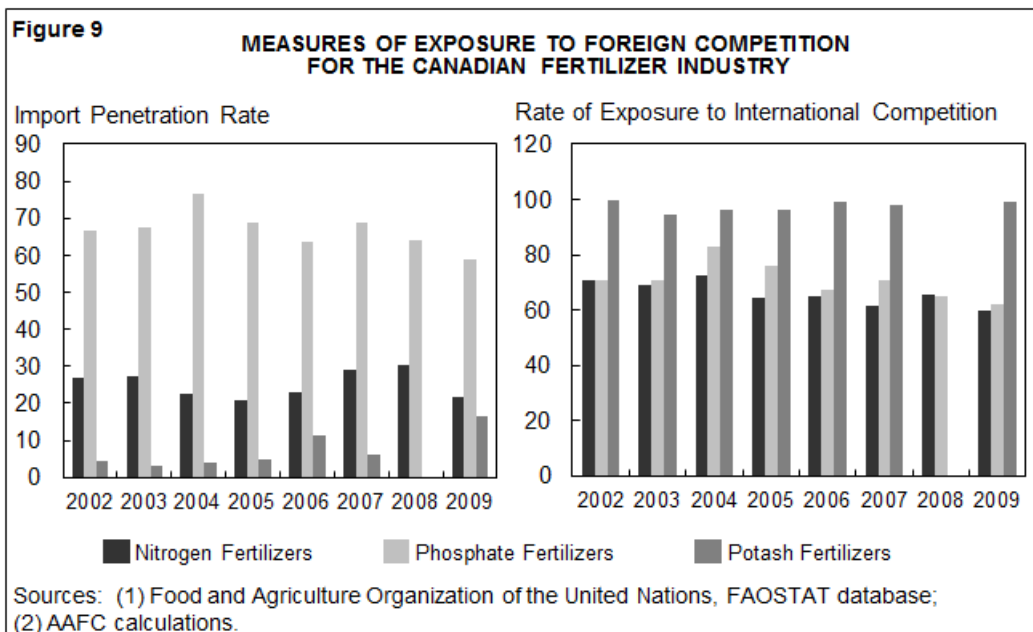
increasing production. The resulting increased demand for fertilizer in recent years has substantially driven up fertilizer prices. **Figure 8** shows how fertilizer prices responded to agricultural commodity prices in Canada.

Fertilizer prices in Canada generally moved in tandem with agricultural commodity prices in most of the years over 1972-2010. For example, strong world demand for fertilizer, supported by favorable crop prices, drove fertilizer prices to historical highs in Canada in 2008. Nevertheless, this direct relationship has sometimes been more than offset by effects of interactions with natural gas prices. For example, in 2005, strong natural gas prices pushed fertilizer prices high despite low commodity prices. Conversely, in 2002, weak natural gas prices kept fertilizer prices low in spite of high commodity prices.



Competition

Canada is one of the world's major exporters of fertilizer, but also an important importer. In 2009, Canadian fertilizer exports represented 85% of production while imports accounted for 31% 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,



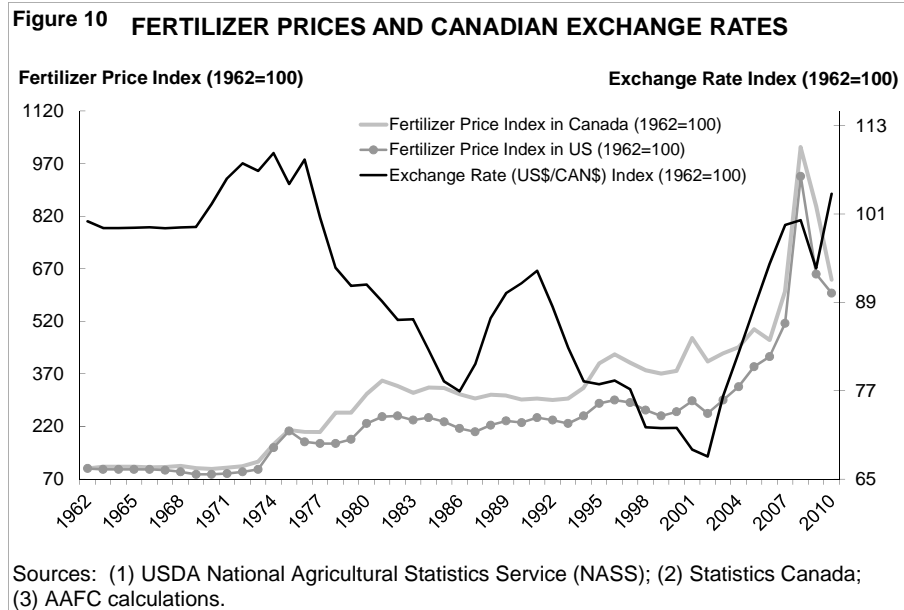
Canadian fertilizer exports also face international competition in global markets. **Figure 9** presents the measures of exposure to foreign competition for the Canadian fertilizer industry over 2002-2009.

The import penetration rates⁴ show the high magnitude of foreign competition within the domestic market faced by Canadian phosphate fertilizer producers. Meanwhile, Canadian nitrogen fertilizer producers confronted relatively little foreign competition, and potash producers faced almost no foreign competition as the domestic market was supplied almost exclusively by domestic production. When domestic and global markets are considered together, the rates of exposure to international competition⁵ show that Canadian potash producers were 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 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 export fertilizer associations, such as the US Phosphate Chemical Export Association and CANPOTEX in Canada, the world's

⁴ Import Penetration Rate = $\frac{\text{imports}}{\text{consumption}} \times 100$.

⁵ Rate of Exposure to International Competition = $\frac{(\text{exports}/\text{production} + (1 - \text{exports}/\text{production}) \times (\text{imports}/\text{consumption}))}{\text{consumption}} \times 100$.



largest exporter of potash, also has a strong influence in setting fertilizer prices in global markets.⁶

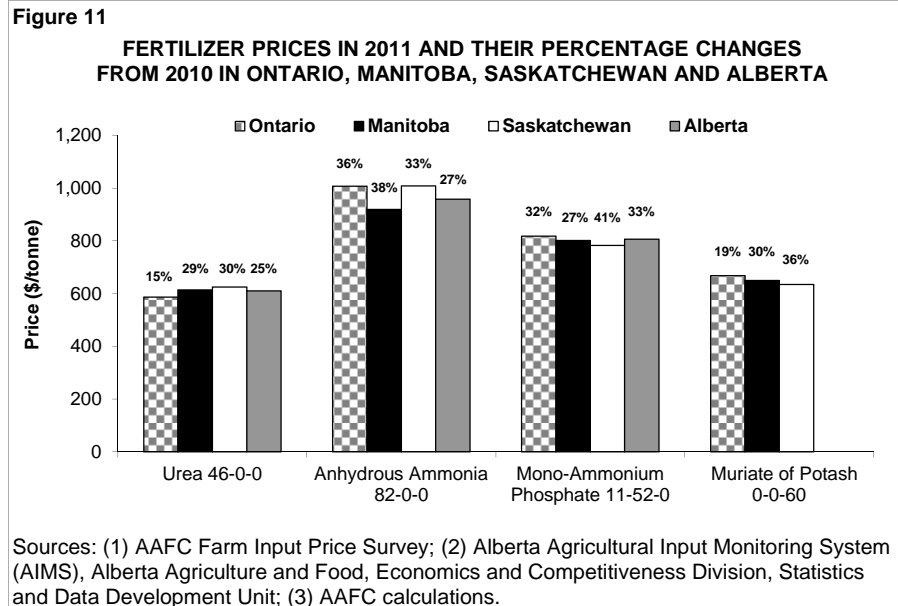
Other Factors

Canadian dollar exchange rates also have an effect on fertilizer pricing as Canadian fertilizer prices either rise or decline to the level of import prices to remain competitive. **Figure 10** 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 depreciated between 1975 and 1986, Canadian farmers paid more for fertilizer purchases as fertilizer prices in Canada increased faster than in the US. Conversely, Canadian farmers made relative savings when the Canadian dollar appreciated over 2003-2008 as US fertilizer prices rose at a greater pace.

Besides exchange rates, government trade policies in major fertilizer exporting and importing countries can influence fertilizer prices in global markets. For example, with short global supplies of fertilizers, higher

⁶ Wen-yuan Huang, February 2009, "Factors Contributing to the Recent Increase in U.S. Fertilizer Prices, 2002-08", United States Department of Agriculture.

export tariff rates on urea, di-ammonium phosphate and mono-ammonium phosphate implemented by China in 2008 further tightened the world fertilizer supplies and likely resulted in higher fertilizer prices than would otherwise had been the case during 2008 and 2009.



FERTILIZER PRICES

A combination of higher energy prices and strong worldwide fertilizer demand due to rising crop prices has induced a tightening in the global fertilizer market balance, resulting in price strength through 2011. **Figure 11** shows prices for the major types of fertilizer, as well as the percentage changes of prices in 2011 as compared to 2010 in Ontario, Manitoba, Saskatchewan and Alberta⁷. AAFC estimates that the average prices paid for fertilizer in Canada increased by about 29% in 2011. This 29% increase in fertilizer prices could translate into about a \$969M increase in the Canadian farmers' 2011 fertilizer bill.

In 2012, fertilizer prices will continue to increase moderately in response to expected high levels of crop planting, particularly in China, India and Brazil, driven by strong food demand. Meanwhile, an increase in energy prices will also put upward pressure on fertilizer prices. AAFC forecasts that the average prices paid for fertilizer in Canada will likely increase another 5% in 2012. However, there is a significant risk for the increase to be greater than 5% if demand for farm outputs grows faster than expected.

FARM FERTILIZER USAGE

Using 1980-2010 annual historical data, the elasticity for fertilizer demand with respect to seeded area of grains and oilseeds was estimated to be 0.5 in Canada. In other words, on average, a 1% increase in seeded area resulted in a 0.5% increase in fertilizer use. In terms of the estimated elasticity and other factors such as seeded area, fertilizer costs and crop prices, fertilizer usage increased by 3% in 2011 in Canada. In 2012, AAFC projects Canadian fertilizer usage will likely increase by another 3% as a large area of unseeded acreage due to flooding in the Prairies in 2011 returns to production.

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 reached \$4.4G in 2011, an increase of 32% over 2010 and greater than the 2006-2010 average annual expenses of \$3.4G. Fertilizer expenses in 2012 are forecast to rise to \$4.8G.

⁷ The potash price in Alberta was not available.