



Bi-weekly Bulletin

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CANADA: FARM FUEL AND FERTILIZER EXPENSES

World petroleum prices spiked in 2005 in response to geo-political risk and higher demand, resulting in much higher prices for farm fuel and fertilizer which will continue to affect farm production costs in 2006. This issue of the *Bi-weekly Bulletin* examines the situation and outlook for the farm fuel and fertilizer expenses in Canada.

For 2005-2006, the Canadian agricultural sector is looking at significant increases in machinery fuel and fertilizer costs. Fuel prices in Canada have reached record highs due to international political uncertainty and slow growth of crude oil supplies relative to the strong growth in international demand. This has been further exacerbated by Hurricane

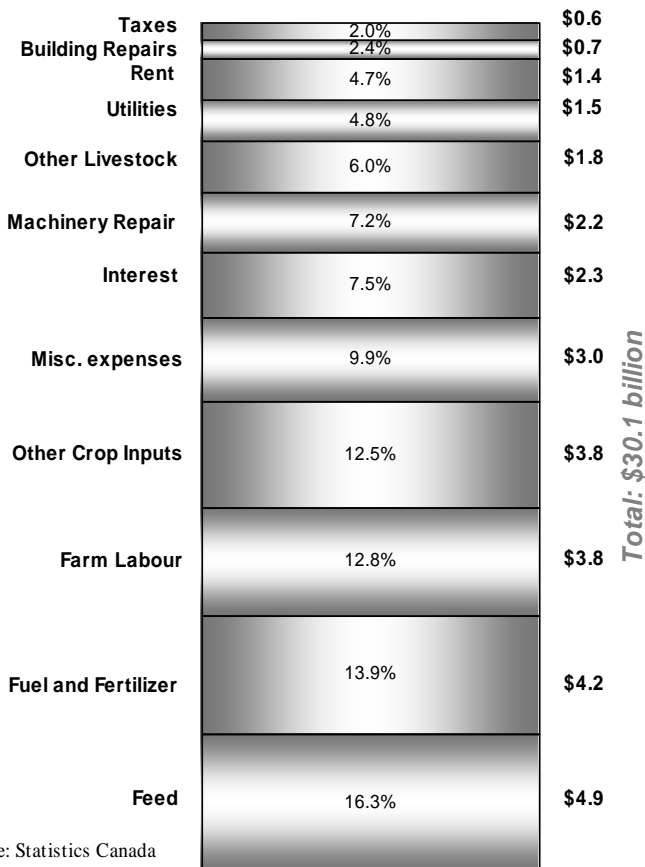
Katrina, then Hurricane Rita, that damaged many United States (US) Gulf Coast oil refineries. Fertilizer prices have also increased sharply as a result of higher energy prices as well as tight supply/demand fundamentals.

Figure 1 shows the components of the 2004 Canadian farm operating expenses. Fuel and fertilizer costs

accounted for 14% of total Canadian farm expenses, representing \$4.2 billion- second only to feed expenses. In using the 2004 as the base year, for every one cent per liter increase in the fuel prices, Canadian farmers' machinery fuel bill was estimated to increase by about \$27 million annually. For fertilizers, every one cent per kilogram increase in their prices would add about \$67 million to the farmers' fertilizer bill. Obviously, the impact of rising fuel and fertilizer prices is significant for Canadian farmers.

Figure 1

CANADA: FARM OPERATING EXPENSES (2004)



Source: Statistics Canada

FARM FUEL EXPENSES

Farm machinery fuel mainly includes diesel and gasoline. The prices of fuel are generally determined by the forces of supply and demand worldwide. As a small, open economy, Canada is a price taker, so for both diesel and gasoline, Canada does not make the markets.

Fuel Prices

While world oil demand is rising, driven by continued economic growth in the US, China and many other areas of the world, crude oil supplies and oil refineries struggle to keep the pace with the demand. Under these conditions, any disruption, such as Organization of the Petroleum Exporting Countries (OPEC) production decisions, hurricanes, Iraq post-war insurgency and other international political and economic uncertainty, could result in a spike in fuel prices.

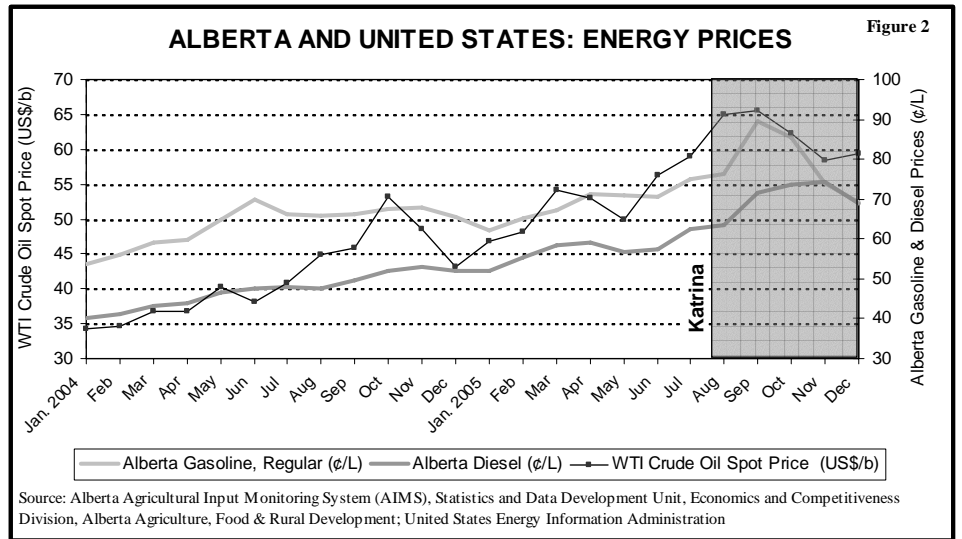
Figure 2 shows that the energy prices in the US and Alberta have increased strongly since 2005. The West Texas Intermediate (WTI) crude oil prices averaged US\$56.49 per barrel (/b) in 2005, which was a 36% increase from the year before. Even before hurricanes Katrina and Rita hit the Gulf States, WTI crude oil prices increased by 26% from US\$46.84/b in January to US\$59/b in July. The Hurricanes disrupted production in the Gulf of Mexico and sent oil prices further higher in August and September.

The Canadian agricultural sector, which relies heavily on fuel to meet a variety of energy needs, was also subject to a substantial increase in prices following the US energy markets. Agriculture and Agri-Food Canada (AAFC) projected the prices for farm machinery fuel to rise by 27% at the Canada level in 2005. These 27% higher fuel prices would translate into about a \$430 million increase in Canadian farmers' machinery fuel bill for 2005.

Tight oil supplies, continued economic growth, limited excess oil production capacity and concerns about potential supply disruption are likely to result in higher and more volatile prices in 2006. The US Energy Information Administration (EIA) anticipated the price for WTI crude oil to average more than US\$63/b in 2006. Diesel prices were projected to show a 5.4% increase, while gasoline prices will likely continue to rise by about 6.2% in 2006. Similarly, after taking into account a strengthening Canadian dollar, AAFC expected farm machinery diesel and gasoline prices to trend upward by about 3.8% in 2006.

Farm Fuel Usage

However, with the rise in prices Canadian farmers don't buy as much fuel as when prices are lower. Figure 3 indicates a tight negative relationship between fuel price and fuel usage. The estimated correlation between them is -0.7, which is quite high. 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.



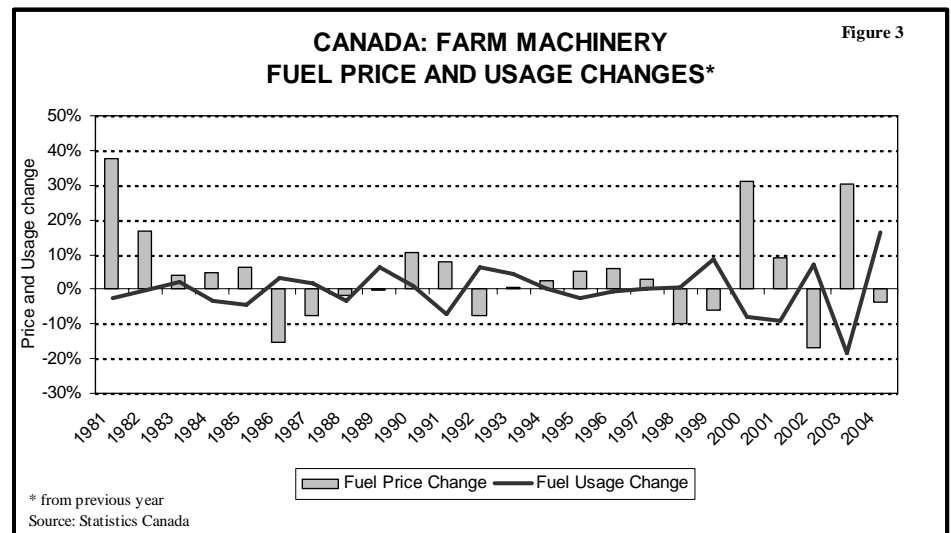
Elasticity is a measurement used by economists to gauge the responsiveness of demand to changes in price. Using 25 years historical data from Statistics Canada, the fuel price elasticity was estimated to be -0.35 at Canada level. This means that if fuel prices increased by 10%, farm machinery fuel usage should decrease by 3.3% at the Canada level. This might be supported by Canadian farming practices. For example, tillage probably uses more fuel per acre than almost any other field operation. Farmers could reduce tillage or the number of trips across the field by combining operations to save fuel, particularly when fuel prices are high.

In terms of the estimated fuel price elasticity and other factors such as seeded area change, AAFC projected

that Canadian farm machinery fuel usage should decrease by about 4.7% in 2005 and will be flat in 2006. When the price increase and quantity decrease were considered together, Canadian farm machinery fuel expenses were projected to reach \$2 billion, increasing by 21% in 2005 and continue to increase by 4.1% in 2006.

FARM FERTILIZER EXPENSES

Canada is a major fertilizer producing country, particularly for nitrogen and potash. Canada exports about 95% of its potash production and about one-half of its nitrogen products, mainly to the US. Canadian fertilizer production is primarily located in Alberta and Saskatchewan.



Major Fertilizer Sources

There are three types of major fertilizers: nitrogen, phosphate and

potash. Urea is a popular dry granular form of nitrogen fertilizer. The major phosphate fertilizers that are currently used in Canada are diammonium

phosphate (DAP) and monoammonium phosphate (MAP) which are produced from rock phosphate. The other major nutrient used in crop production is potash fertilizer. Most potash deposits in North America are found in Canada, especially, Saskatchewan.

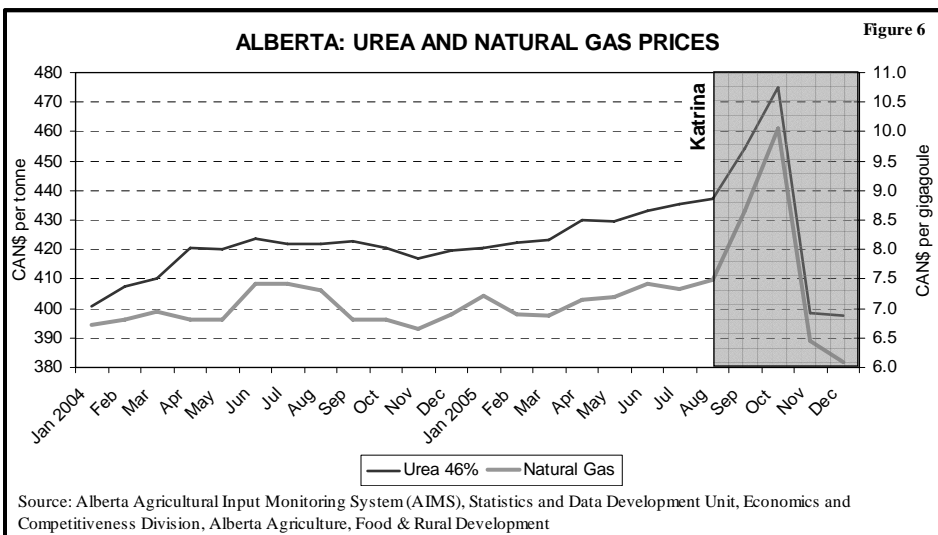
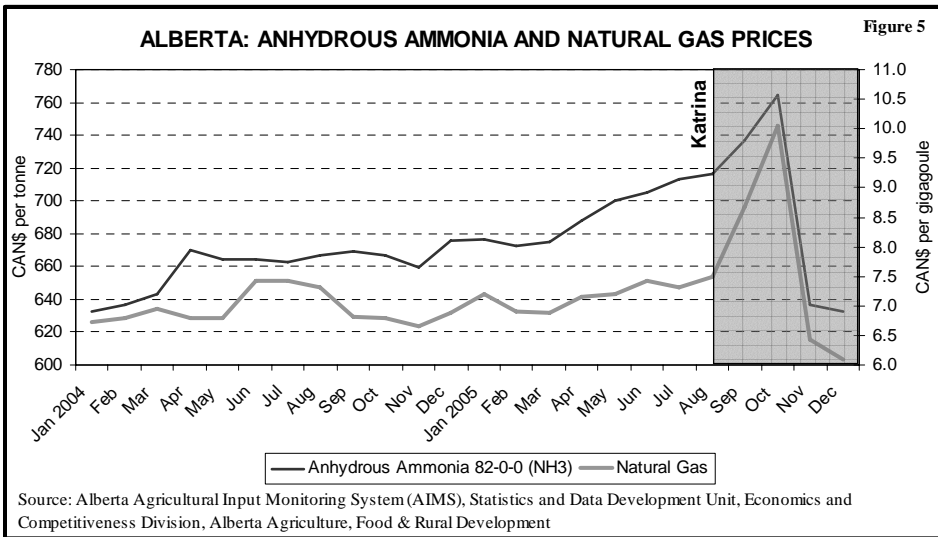
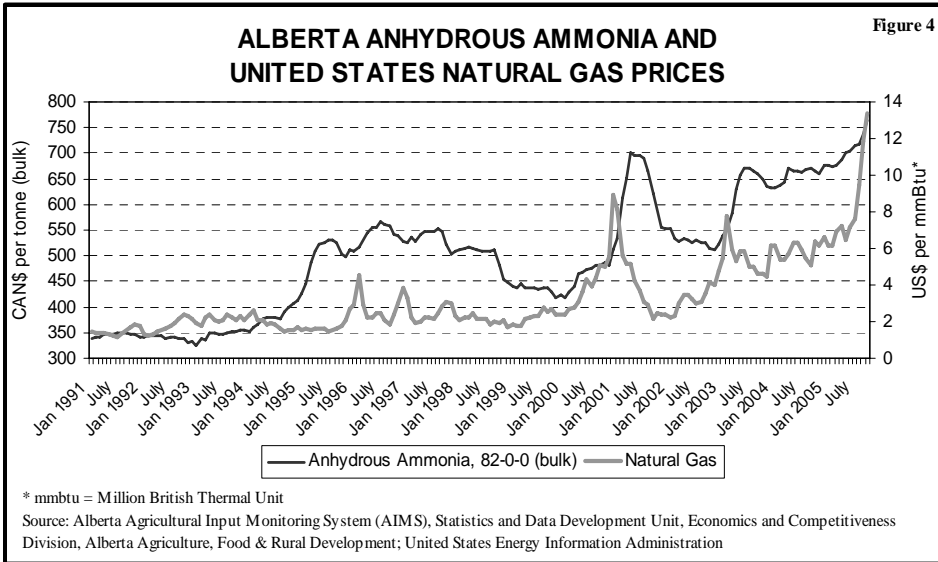
Nitrogen fertilizer is the major nutrient used in crop production by Canadian farmers. About 65% of the fertilizer used by the Western farmers and 54% of the fertilizer used by Eastern farmers is nitrogen fertilizer. Phosphate fertilizer accounts for 26% of total fertilizer usage in Western Canada, while potash fertilizer accounts for 24% of total usage in Eastern Canada which is mainly for soybean production. The remaining fertilizers account for a relatively smaller percentage of the total.

Fertilizer Prices and Natural Gas Prices

Anhydrous ammonia is the source of nearly all the nitrogen fertilizer produced in the world. The production of anhydrous ammonia involves: $\text{Air (N}_2\text{)} + \text{Natural Gas (CH}_4\text{)} = \text{Anhydrous ammonia (NH}_3\text{)}$. Since air is free, the major cost of manufacturing anhydrous ammonia is associated with the cost of natural gas. The cost of natural gas is usually believed to account for 70-90% of the production cost of ammonia. Most other forms of nitrogen are produced using anhydrous ammonia. Therefore, nitrogen fertilizer prices are very much susceptible to changes of natural gas prices.

Figure 4 shows that fertilizer prices did generally follow the pattern of natural gas price changes.

The correlation between the price of natural gas and the price of fertilizer was estimated to be 0.72 based on 15 years of monthly data. It indicated that they were very closely tied together. Therefore, as natural gas prices went up, nitrogen fertilizer prices would increase in a similar fashion. This tight relationship, however, has not always held. In the mid-1990s strong fertilizer demand in combination with near-full industry capacity utilization kept fertilizer prices high despite low natural gas prices.



As *Figures 5 and 6* highlight more closely, fertilizer prices, following natural gas prices, trended up in Alberta over 2004-2005. The anhydrous ammonia price increased by 5.1% in 2005 mainly driven by higher natural gas prices that increased by 6.5%. The upward nitrogen price trend in 2005 was further exacerbated by the extensive damage to the US natural gas infrastructure caused by Hurricanes Katrina and Rita. The hurricanes sent the anhydrous ammonia price in Alberta to \$751 per tonne in September and October, rising by about 8.3% compared to the average price in January-August 2005. Since urea is commonly produced using anhydrous ammonia, the urea price followed the similar pattern.

Besides the natural gas price, the prices of gasoline and diesel also affect the price of fertilizer as fuel represents part of the cost of marketing fertilizer. Higher fuel prices increase the transportation component of fertilizer prices at the retail level. However, the price of fertilizer is much more dependent on the price of natural gas than the price of fuel.

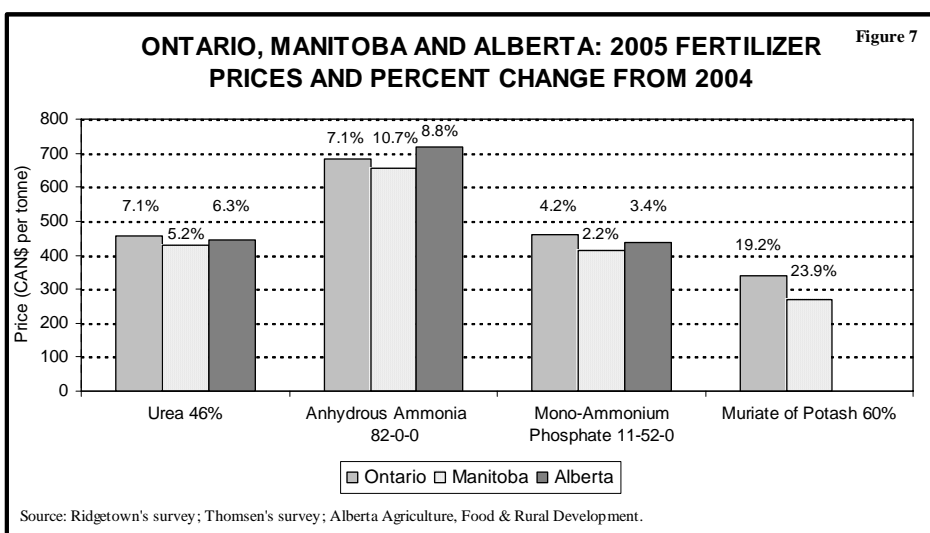
As a world market commodity, fertilizer prices are also determined by the supply and demand factors in major markets around the world. Actually, increased global demand for fertilizer has played a large part in recent years

in placing upward pressure on fertilizer prices. Supply factors have also played a part in driving up fertilizer prices due to limited new global production capacity. *Figure 7* shows major fertilizer price levels as well as percentage changes compared to previous year for Ontario, Manitoba and Alberta in 2005. Overall, AAFC projected that fertilizer prices should increase by about 8% in 2005 and will probably continue to increase by about 2.8% in 2006. However, given high volatility of natural gas prices, it should be noted that fertilizer price increases could be stronger in 2006 if the natural gas prices exceed present projections.

Fertilizer Usage

Using 25 years historical data, the fertilizer price elasticity was estimated to be -0.34 at Canada. This means that historically a 10% increase in fertilizer prices resulted in a 3.2% decrease in use. In terms of estimated fertilizer price elasticity and other factors, fertilizer usage was projected to be down by 1.3% in 2005 and flat in 2006.

Farm fertilizer expenses include all costs associated with the purchase of fertilizer including spreading. In Canada, fertilizer expenses were projected to reach \$2.7 billion, increasing by 7% in 2005, and will continue to increase modestly in 2006 due to higher fertilizer prices.



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