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What's Inside?

Our cover story highlights how the 2016 Census results will allow us to examine the evolution of farming in Canada.

Inside, researchers revisit a 20-year-old study of grain corn yields and find a common result.

Another study explores whether Canadian consumers are saving at the pumps when the price of crude oil drops. On the back page, read about the effects of productivity, trade and the exchange rate on Canada's food manufacturing industry.

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The FARE Share Newsletter features research and analysis from faculty and students in the Institute for the Advanced Study of Food and Agricultural Policy in the Department of Food, Agricultural and Resource Economics (FARE).

Changing Face of Canadian Farms

By: *Alfons Weersink, Professor, FARE*



Mapping the evolution of Canada's farm industry is not as simple as just examining the 2016 Census numbers.

The definition of a farmer and a farm is based on the potential ability and desire to sell agricultural products. It does not include a minimum sales criterion. Before 1991, such a threshold had to be met. And it still does in the United States, where a census farm is any operation that normally generates at least \$1,000 of agricultural produce. In Canada, however, farmers and the farms they operate are self-identified with potentially minimal sales.

“The 2016 Census will likely reveal a continuation of a trend noted over the last 50 years: a decline of about 10 percent in the number of farm operators and farms over the last five years between censuses.”

The all-encompassing definition of a farm permits a measurement of total agricultural production. Someone who self-identifies as a farmer will be asked to detail the inputs used (i.e. time spent on farm work and area of land cropped) and the outputs produced (i.e. inventory of crops and livestock). Thus, total production of a commodity such as potatoes includes the volume sold by large full-time operators to major processors and those sold by individuals to friends and family.

Determining aggregate measures such as total production or farmland area requires measuring all potential farmers and farms.

However, there are cautions with using such a broad definition of a farm for other purposes.

The 2016 Census will likely reveal a continuation of a trend noted over the last 50 years: a decline of about 10 percent in the number of farm operators and farms over the last five years between censuses. Assuming the trend continues, there are fewer than 200,000 farms in Canada and approximately 275,000 farmers running these farms.

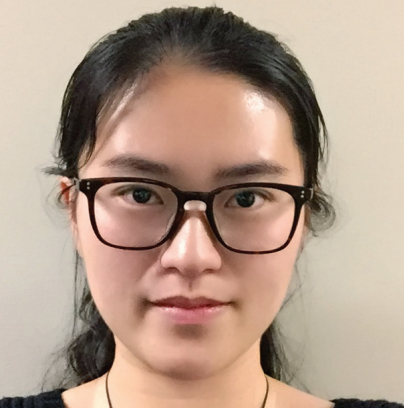
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Corn Yield Trends

Research by: Qin Xu, Ph.D. Graduate Student, FARE; Glenn Fox, Professor, FARE; and Dan McKenney, Chief, Landscape Analysis and Applications, Great Lakes Forestry Centre, Natural Resources Canada

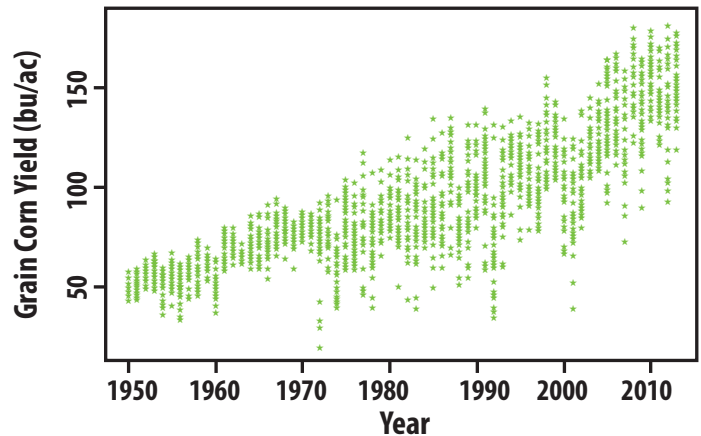
Nearly 20 years after researchers Brad Rickard and Glenn Fox asked “Have Grain Yields in Ontario Reached a Plateau?” a new University of Guelph study revisited the question and found the same answer.

In 1999, Rickard (now an Associate Professor at Cornell University) and Fox noted that grain yields in Ontario had been increasing for many years and questioned suggestions that agricultural innovation was approaching a technology frontier. After studying Ontario crop yield data from 1888 to 1995, they found that grain yields in Ontario had not yet reached a plateau and would not do so after some time.

The new study covers the period from 1950 to 2013. Once again the data confirms that grain corn yields in Ontario have not yet plateaued. The new study includes spatial climate data obtained from Natural Resources Canada, which was not available for the previous study. The econometric crop yield model also incorporates other factors — climate, economic and technology — in an attempt to explain what influences yield trends in the province. This model is part of the Ph.D. dissertation research in a forthcoming thesis by Qin Xu.

Figure 1 shows that grain corn yields in Ontario increased approximately three times since 1950, from approximately 50 bushels/acre in 1950 to around 150 bushels/acre in 2013. In recent years, however, there have been some fluctuations around this trend with exceptional weather conditions or pest and plant disease problems. For example, the extreme dry weather in 1988 and 2001 resulted in relative low corn yields. If years of extreme weather become more frequent, then future yields may exhibit more volatility than has been observed in the past.

Figure 1: Average Grain Corn Yields for 29 Counties in Ontario 1950-2013



Source: Authors' calculations based on Agricultural Statistics for Ontario, 1950-2013

Available moisture and solar energy are the main climate factors used in the model. Results show that the corn yields would be higher if there were more precipitation and solar energy during the growing season. However, higher precipitation prior to the growing season seems to reduce yields.

Results also indicate that the corn yields are positively related to the corn price lagged one year and are negatively related to the fertilizer price, as one might expect.

A time trend and a squared time trend is used as a representation of the effects of technological progress in corn production. The coefficients on both the time trend and the squared time trend were positive and significant, suggesting that the increase of corn yields have not yet slowed down in Ontario.

FARE Talk Subscribe to our Podcasts

Enlightening discussions about contemporary topics relevant to food, agricultural, and resource economics

What's The Buzz? A Discussion of Bees and Neonics

In this podcast, Dr. Cynthia Scott-Dupree, Bayer CropScience Chair in Sustainable Pest Management, School of Environmental Sciences at the University of Guelph, and FARE Professor Dr. Brady Deaton discuss the science that informs understanding of the relationship between bees and neonics – a pesticide recently subject to new restrictive regulations in Ontario and elsewhere. In our discussion we address a number of questions including: What are neonics? What do we know about bees and recent bee population changes? Are neonics toxic to bees? Do neonics pose a risk? In our discussion we discuss the meaning, method, and evidence regarding toxicity and risk, and explain the difference.

To listen to the complete conversation and other podcasts, visit the FARE website: <http://www.uoguelph.ca/fare/FARE-talk/index.html#bees>





Do Consumers Save When Oil Prices Drop?

Research by: Nathaniel Whittingham, M.Sc. Graduate Student and Rakhal Sarker, Associate Professor, FARE

Energy plays an important role in the Canadian economy. Despite efforts to diversify energy sources, gasoline remains the most important source of energy in Canada. According to the U.S. Energy Information Administration, Canada was the fifth largest producer of gasoline in the world in 2015, behind the United States, Saudi Arabia, Russia and China. Canada was also the fifth largest exporter of crude oil in 2015, exporting just over \$50 billion USD, preceded by Saudi Arabia, Russia, Iraq and the UAE. Canada is also one of the top 10 consumers of gasoline in the world.

In a country with so much interest in production, consumption and export of gasoline, Canadians pay close attention to wide price swings. In the past five years, crude oil prices have taken a roller coaster ride, hitting a high of \$130 USD/barrel and a low of \$28 USD/barrel, with several intermediate levels in between. As the price of crude oil changes, do retail gas prices increase and decrease by the same magnitude?

“Retail gasoline prices across Canada are not as responsive when the crude oil price drops as when it rises.”

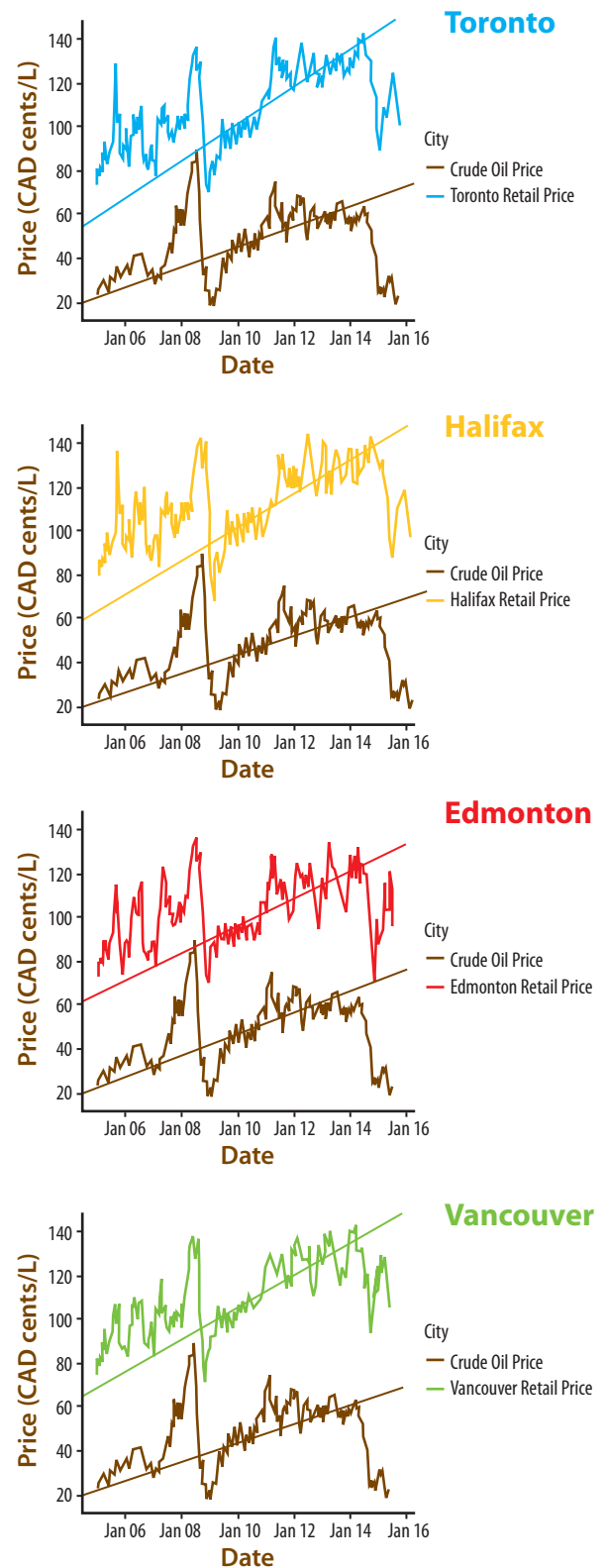
Bacon (1991) used ‘Rockets and Feathers’ as metaphors to describe his findings related to the UK retail gasoline market; retail prices adjusted very quickly to rising crude oil price (like a rocket) but adjusted rather sluggishly when crude oil price declined. Peltzman (2000) revealed similar results for gasoline and many other commodities in the United States.

It is widely perceived that this phenomenon also exists in the Canadian retail gasoline market today. Does the pattern vary across regions and cities in Canada? Do they vary over time? The primary objective of this research is to shed light on these issues using recent data from four Canadian cities.

Figure 1 compares the movements of retail and crude prices in Toronto, Edmonton, Halifax, and Vancouver between 2005 and 2015. These cities are chosen to provide an understanding of this relationship across Canada. Trend lines were drawn using data from February 2, 2009 to August 8, 2014. This period hosts the relationship between crude and retail gasoline prices during the two most recent crashes. As seen in Figure 1, the gap between two trend lines widens over time for three of the four cities (Toronto, Vancouver and Halifax). While the pattern of this relationship differs across cities, it suggests an asymmetric price transmission between crude oil and retail gas prices in Canada.

Researchers used the Houck-Wolffarm approach to investigate asymmetric price transmission in this market. Analysis of weekly data for nine Canadian cities from 2000 to 2015 reveals there is asymmetric price transmission in the Canadian gasoline market. This means that the retail gasoline price is not as responsive when the crude oil price drops as it is when the crude price rises in this country. A direct implication of the findings is that consumer benefit is much smaller than anticipated when the crude oil price drops in Canada. A host of domestic and external factors may be contributing to this behaviour in the Canadian gasoline market.

Figure 1: Movement of Crude and Retail Gasoline Prices



Evolution of Farming in Canada

Another trend likely to continue will be the growth in the number of commercial farms with sales greater than \$250,000. In addition to its share of the total number of farms, the absolute number will have increased to approximately 50,000. Hence, the decline in the number of farms and farmers will largely be associated with demise of small commercial operations and not those with sales greater than \$250,000.

The increase in the number of large commercial farms and the number of small part-time farmers reflects a growing diversity in the farm sector. Two generations ago, the countryside was fairly homogenous with single full-time farmers operating farms that supported single families. Now, many farmers can be involved in a single farm, and a single farmer can run several farms. At the same time, approximately half of the farmers have full-time work off the farm.

The all-encompassing definition of a farmer requires us to be cautious when interpreting the total numbers and averages associated with those numbers. Totals will likely be lower than the last census, but the number of farmers with meaningful agricultural production, and to which farm policy is targeted, are likely to grow.

Given the large and likely growing number of very small farm operators, average performance measures will be distorted if we use the aggregate numbers to assess the health of the sector.

Canadian Food Manufacturing Competitiveness

Research by: *Natalia Piedrahita, M.Sc. Graduate Student and Getu Hailu, Associate Professor, FARE*



Productivity growth is considered a key source of economic development and competitiveness, which translates into social progress. Given Canada's limited market size, the food processing industry's ability to increase productivity depends on its ability to compete in international markets. With the lower Canadian dollar and the Trans-Pacific Partnership (TPP) agreement, there is an opportunity for Canadian food exporters to become more globally competitive.

Food processing is Canada's leading manufacturing employer, accounting for 236,000 jobs, and the second biggest by revenue. Ontario boasts the largest agri-food industry in the country. Over the past decade, when other sectors experienced a decline in revenue, food manufacturing in Ontario continued to grow at a rate of 1 percent per year.

“A positive relationship between exports and food manufacturing productivity suggests that investing in export promotion and lowering trade barriers could have a positive effect on the industry's competitiveness.”

As a result of the industry's resilience and importance, Ontario's Premier challenged the agri-food sector at the 2013 Premier's Agri-Food Summit to double its annual growth rate and create 120,000 jobs by the year 2020.

The post-2000 economic climate, however, poses various challenges for Canada's food manufacturing industry to achieve this target. Some of these include the appreciation of the Canadian dollar, higher input costs, and lower

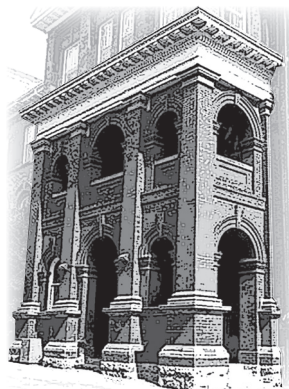
output prices, low investment in research and development, and a declining trade balance with the United States.

Due to Canada's limited market size, the industry's survival depends on its ability to compete in international markets. A symptom of lagging competitiveness has been the trade balance, which is impacted by the value of the Canadian dollar. In the post-2000 period, when the gains from NAFTA had already been realized and the value of the Canadian dollar began to rise, the trade deficit in the industry increased rapidly. This implies that the relative competitiveness of the industry is declining, which makes achieving the aforementioned goals a difficult task.

Proponents of free trade argue that trade eases the transfer of ideas across countries and gives exporters access to larger markets, allowing them to explore economies of scale, and increase productivity. Similarly, tariff reductions increase average labour productivity as they lead to an increase in export orientation as more productive firms expand and the least productive ones exit the market.

This study uses recent econometric models to determine the relationship between labour productivity, export-to-sales ratio and exchange rate. Results suggest that as exports increase so does labour productivity, and as the price of the Canadian dollar increases, labour productivity declines.

The finding of a positive relationship between exports and food manufacturing productivity suggests that investing in export promotion and lowering trade barriers could have a positive effect on the industry's competitiveness. The TPP and the lower Canadian dollar provide an opportunity for food manufacturers to become more globally competitive, reduce the trade deficit, and increase relative competitiveness.



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