Climate Change Adaptation and Canadian Agriculture: Potential Investment Opportunities

Average global temperatures have been trending higher for the last few decades, and more than 90% of climate scientists attribute global warming to an increase in the concentration of greenhouse gases in the atmosphere generated by human activity.\(^1\) The agriculture and food system will likely play a leading role in both mitigating climate change by reducing emissions, and adapting to climate change by farming in new ways in new areas in order to meet nutritional demands of the global population. Agriculture is recognized as a sector that is particularly sensitive to changing temperatures and precipitation patterns. Concerns have been raised that changing climate conditions, such as increasing heat stress, more limited precipitation and more extreme weather events, could seriously compromise growing conditions and negatively impact crop productivity. However, in northern latitudes, for countries such as Canada, Russia and those in Northern Europe, the anticipated weather shifts from climate change are more likely to be favorable for agricultural production.\(^2\)

Developing a better understanding of how climate change will impact Canadian agriculture is important in shaping investment strategy and portfolio construction for a farmland investor. Climate change will be a key determinant of changes in the relative competitiveness between different regions, and the appropriate assumptions on future crop mix and yield will be essential in properly underwriting investments in Canadian farmland. While precisely forecasting future outcomes for large, complex systems like climate is not possible, understanding relative direction and the associated probabilities of expected long-term changes in climate will help to identify investment opportunities and risks and to guide operational decisions.

\(^1\)MIT Climate Science and Solutions, May 2020, [https://climateprimer.mit.edu/](https://climateprimer.mit.edu/)
\(^2\)W.N. Smith, B.B Grant, R.L. Desjardins, R. Kroebel, C. Li, B. Qian, D.E. Worth, B.G. McConkey, C.F. Drury, September 2013, Agriculture, Ecosystems and Environment, Assessing the effects of climate change
Background and Baseline

Over the last two decades, improvements in crop yields for multiple major crops in Canada has outpaced most other advanced economies, including the United States.\(^3\) A range of factors have contributed to these gains, including the application of financial and human capital and technology, but a warming climate has also had a positive impact.

Canada’s warming trend is well underway. Over the period 1998 to 2018, each annual average temperature for Canada was warmer than the 1901-2000 baseline average.\(^5\) Canada’s rising average temperature has led to longer growing seasons. These warmer temperatures have helped enhance crop yields and enabled a shift to higher-value crops that need more frost-free days: corn and soybeans comprised 8% of Canada’s harvested area in 2004, steadily growing to 12% by 2018.

For Canada’s two largest crops by area and value, canola and wheat, average annual yield growth has exceeded that of the U.S. and the world average in the period 1998-2018.\(^8\) Although warmer temperatures are not the only contributor, they are certainly an important one. The simultaneous upward trends in yield and harvested area indicates that yield growth was shared across established and new growing areas in Canada.

Case Study – Corn and soybeans in Manitoba

Manitoba, in the heart of Canada’s prairies, was historically a key area for wheat, barley, and canola. Manitoba’s southern border is adjacent to Minnesota and North Dakota. Chart 6 shows that, especially since 2001, the production of corn and soybeans in southern Manitoba has expanded, and this trend has persisted even after soybean prices declined after 2017. Farmland values in Manitoba, based on transaction data from Farm Credit Canada, grew rapidly from 2012 to 2017.\(^11\)

\(^3\) USDA Production, Supply and Distribution as of August 2020, HNRG Research calculations, 1998 to 2018 marketing years

\(^6\) Source: Statistics Canada, May 2020
\(^8\) USDA Production, Supply and Distribution as of August 2020, HNRG Research calculations, 1998 to 2018 marketing years
\(^9\) USDA Production, Supply and Distribution as of May 2020

Climate Outlook for Canada

Looking forward 10-20 years, there is a broad consensus that climate change will result in warmer average temperatures in Canada. The Intergovernmental Panel on Climate Change (IPCC) climate forecast is for average annual temperatures across Canada to increase 0.5-1.5 degrees Celsius through 2030 compared to a 1990 baseline. This projected increase in average temperature reflects the forecasts from several different emission scenarios and models. The outlook at a national level for Canada is mixed for precipitation, with greater precipitation in some regions and drier conditions in others.

The Canadian Centre for Climate Services projects that even in a low emission scenario, mean temperatures for Canada are expected to increase in 2021-2040 compared to 2000. The Climate Atlas of Canada, created and managed by the Prairie Climate Center at the University of Winnipeg, provides estimates of future temperatures, precipitation and growing season under several emission scenarios. In each scenario, five factors that are related to agricultural performance are projected to increase, most notably the frost-free season and growing degree days. Estimates of future climate are probabilistic ranges rather than point estimates, due to the uncertainty in climate modeling. For Canada, the climate outlook is for warmer temperatures, leading to an increase in frost-free days and a longer growing season, enabling more favorable growing conditions, and potentially longer windows for planting and harvesting. The extra growing days, which will vary regionally across Canada, represent a meaningful opportunity to achieve higher yields, increase planted area and shift the crop-mix to higher value crop types.

Recognizing Climate Change as an Investment Opportunity for Canadian Agriculture

The impacts of climate change on agriculture will not be uniform across regions. In Canada, the magnitude of the climate change related potential upside and downside impacts will vary by crop, region and time-period.

The primary opportunities for Canadian agriculture include capturing land use and crop mix changes afforded by a longer growing season, but technology will play a prominent role in enabling and advancing agricultural productivity the adaptation to the agriculturally more favorable climatic conditions. This process includes a

\[\text{Canadian Canola Yields Outpace the World}\]
\[\text{Canadian Wheat Yields Grow Faster than the U.S.}\]
\[\text{Corn and Soybeans Grow in Manitoba}\]
positive feedback loop to innovation where increased scale of crop production in new regions enables additional research and development investment by ag tech companies. Based on a wide range of studies, crop productivity is expected to increase over the coming decades; wheat yields are projected to continue to trend higher; and conditions will likely be more favorable for corn in western Canada. Farm revenue and margins will benefit as the marginal increase in the growing season widens the range of crops that can be grown in Canada, adding resilience and greater adaptability to the Canadian agricultural sector.

Deployment of new technological solutions will also be needed to mitigate against possible climate-change associated risks, such as more variable precipitation and potentially additional pest pressure due to warmer temperatures.

Although a warmer climate holds potential benefits for many parts of Canada’s agriculture sector, climate change also brings heightened risks, including increased weather uncertainty, and potentially more volatile temperature and precipitation patterns. Given that the majority of Canadian agriculture cropland is dryland, this could pose a risk to crop yields in some regions. More volatile precipitation could also present new challenges for irrigation water supply and drainage, both of which are key to crop production in various regions. The IPCC projections indicate the potential for additional risk factors to crop performance, such as temperature extremes, more variability in precipitation, reduced mountain snow/ice and higher sea levels.

Investment Strategy Implications

Canada has vast natural resources, the world’s second-largest land mass, abundant fresh water and extensive energy sources. The country’s investment environment benefits from economic scale as the world’s tenth largest economy, political stability, free trade agreements with most of the world’s largest economies, and a close relationship with the United States. For investors in farmland, the addition of Canadian properties to a diversified portfolio has a strong rationale and will need a clear assessment of the relative risk and return of Canadian farmland relative to other regions. A key question will be how the overall forward-looking climate risk of Canadian farm assets compare with other major agricultural investment regions whose climate change associated risk profile might be more challenging than for Canada.

Looking Forward

Climate change is leading to significant shifts in growing conditions for agriculture globally. In Canada, while increased climate uncertainty will likely bring new risks requiring adaptation, a warmer climate opens substantial new opportunities in crop productivity and crop mix. Understanding and estimating trends and implications for each crop and region is important for improving investment selection, valuation and management.

17Ochuodho, Lantz and Olale, Forest Policy and Economics, Economic impacts of climate change considering individual, additive and simultaneous changes in forest and agriculture sectors in Canada: A dynamic, multi-regional CGE model analysis, December 2015
18W.N. Smith, B.B Grant, R.L. Desjardins, R. Kroebel, C. Li, B. Qian, D.E. Worth, B.G. McConkey, C.F. Drury, September 2013, Agriculture, Ecosystems and Environment, Assessing the effects of climate change
20The World Bank, May 2020
21International Monetary Fund, May 2020
Important Information

A widespread health crisis such as a global pandemic could cause substantial market volatility, exchange trading suspensions and closures, and affect portfolio performance. For example, the novel coronavirus disease (COVID-19) has resulted in significant disruptions to global business activity. The impact of a health crisis and other epidemics and pandemics that may arise in the future, could affect the global economy in ways that cannot necessarily be foreseen at the present time. A health crisis may exacerbate other pre-existing political, social and economic risks. Any such impact could adversely affect the portfolio’s performance, resulting in losses to your investment.

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