



Contribution of Agricultural Biotechnology to Food Security in Canada

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An evaluation of the contribution of agricultural biotechnology and technological innovation to food security in Canada showed these innovations significantly reduce production costs and enhance food security in Canada. Technological improvements may stabilize farm-level production costs, however retail food prices continue to be impacted more by downstream processes such as transportation, packaging and retail operations. In the future, these agricultural innovations show considerable promise in strengthening Canada's food security framework, benefiting both producers and consumers.

Across the agri-food sector in Canada, both producers and consumers are concerned about rising costs, productivity, quality and sustainability. Rates of food insecurity have also increased over the past decade in Canada, reaching 22.9% in 2022. The goal of this study was to evaluate the contribution of agricultural biotechnology to the four core pillars of food security in Canada, including availability, accessibility, utilization, and stability.

Through a comprehensive literature review, national dataset analysis and economic modeling, an evaluation of the technical, economic, environmental, and regulatory factors within the Canadian

agri-food context was conducted. The review included supplementary international studies. The results of the research also support evidence-based policy recommendations for advancing food security through innovation.

The review shows that agricultural biotechnology innovations, including herbicide-tolerant and insect-resistant crops have contributed to improved crop diversity, expanded growing seasons, reduced reliance on fuel-intensive agrochemical applications and enhanced resilience to climate stressors. This has contributed to more stable yields and lower production costs for producers. Other innovations are increasingly designed to address food quality and broader environmental integrity, such as improving nutrient density, extending shelf life, and reducing contamination risks. These advancements enhance food safety and consumer health outcomes. Additional biotechnology applications central to agricultural sustainability efforts promote soil health, protect water resources, and enhance crop resilience to climate-induced stressors.

Consumers supportive of innovation

The findings suggest these innovations enhance the competitiveness of Canadian producers and have the potential to stabilize retail food prices, however, their potential contribution to food security depends on the economic viability of technologies. For producers, sufficient profit margins and profitability of new technologies determines whether or not these advanced solutions are adopted. Canadian consumers are broadly supportive of new technologies, particularly around food safety and sustainability, despite limited familiarity with the technical details.

The review also showed that regulatory frameworks must evolve at the same time as scientific progress and be harmonized with regulations of other major crop producing countries. This is key to encouraging sustained innovation in Canadian food systems and supporting long-term food security goals. Policy environments must also be responsive to innovation, however transparency, competitiveness, and public trust must be maintained.

For consumers, food accessibility and affordability are their biggest concerns, both which are directly influenced by the cost and stability of production. Although technological improvements may stabilize farm-level production costs, their direct impact on retail prices is limited due to downstream costs. Retail food prices continue to be impacted more by downstream processes along the value chain such as transportation, packaging and retail operations.

According to the review, 2022 saw an overall food price increase of 9.7%, the highest annual rate increase since 1981, with fruit prices increasing by 10% and vegetable prices by 8.2%. These recent

inflationary pressures had a significant impact on food accessibility and food security in Canada. The price increases were related to several interrelated global and domestic disruptions including severe and unpredictable weather patterns in the Prairie Provinces. The volatility in the energy sector led to increased fuel costs. The COVID-19 pandemic disruptions to the supply chain continued into 2022. Other factors such as the geopolitical fallout from the Russian invasion of Ukraine, one of the world's largest grain exporters, had an impact on commodity markets.

Overall, the findings suggest that both improved seed technologies and conventional crop protection methods significantly reduce production costs, promote both food safety and environmental sustainability and enhance food availability in Canada. The innovations improve resiliency in the Canadian food system as climatic, economic and ecological pressures continue to increase. The recent agricultural biotechnology innovations show considerable promise in strengthening Canada's food security framework, benefitting both producers and consumers.

The findings also highlight limitations of the evaluation, particularly the absence of farm- and retail-level data stratified by crop trait status. In order to align scientific advances with measurable improvement in food access and sustainability, Canada must enhance data collection, improve regulatory clarity, and invest more consistently in agri-food research and development. Future surveys should more directly link agronomic innovations to farm input costs, market prices, and food access outcomes. This would enable a more robust economic and food security strategy and strengthen Canada's food security framework.

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