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# Enhancing Agricultural Research and Development for Sustainable Growth in Canada

By Sabrina Gulab and Guillaume Lhermie

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## EXECUTIVE SUMMARY

The Canadian agriculture and food sector is an essential contributor to the national economy, providing food for domestic consumption and playing a pivotal role in global food security. However, the sector is increasingly challenged by environmental pressures, including carbon emissions, water scarcity and biodiversity loss. In response, Canada aims to promote eco-friendly practices, increase food security, improve productivity and ensure the agriculture sector's long-term viability and competitiveness. Despite substantial investments in agricultural research and development (R&D), there remains a lack of comprehensive tracking and alignment between public- and private-sector funding. This report provides a detailed analysis of R&D funding trends, identifies key research priorities and makes recommendations to enhance Canada's agricultural R&D ecosystem for greater sustainability, productivity and competitiveness.

## INTRODUCTION

The Canadian agriculture and food sector is one of the country's most significant industries, contributing approximately seven per cent to the national GDP in 2023 (AAFC 2023). With over 2.3 million people employed and $150 billion in annual revenue, the sector plays a dual role in ensuring food sovereignty within Canada and supporting global food security. However, the sector faces numerous challenges, including increasing pressure from climate change, environmental degradation, international geopolitical events, zoonotic diseases and animal health challenges and the need for sustainable agricultural practices.

As part of its commitment to tackling climate change and ensuring food security, Canada has set a target to reduce carbon emissions by 30 per cent by 2030 (AAFC 2023). The federal government's 2024 Sustainable Agriculture Strategy outlines a vision for an eco-friendly, productive and sustainable agriculture sector, focusing on environmental stewardship, food security and economic growth.

Central to achieving these goals is the role of agricultural R&D to ensure we can meet these objectives while increasing productivity and competitiveness. Over the years, scientific advancements have allowed Canadian agriculture to meet competing priorities, such as enhancing productivity, mitigating climate impacts and improving food safety. However, despite  the high returns on R&D investment — such as the return of $10 for every dollar spent — agriculture remains underfunded in comparison to other sectors, especially in high-income countries (Alston, Pardey and Rao 2021; OECD 2022). The under-investment in agricultural R&D presents a critical challenge, as insufficient funding hinders the advancement of sustainable practices and innovative technologies needed to tackle global agricultural challenges.

## THE ROLE OF AGRICULTURAL R&D IN CANADA'S AGRICULTURE AND FOOD SECTOR

### KEY ACTORS AND STAKEHOLDERS

The Canadian agriculture and food research ecosystem is made up of various actors who contribute to the generation and dissemination of knowledge. These include public-sector funders, private industry, academic researchers and intermediary organizations.

**Public Sector:** Government bodies, such as Agriculture and Agri-Food Canada (AAFC) and provincial research institutes, are major funders of agricultural R&D, directing investments towards basic, applied and in-field research.

**Private Sector:** Agribusinesses, biotechnology firms and other private entities invest in R&D, particularly in precision agriculture, biotechnology and digital tools to enhance crop and animal health.

**Academic Institutions:** Universities, colleges and research centres are at the forefront of agricultural innovation, conducting research in areas such as plant genetics, soil health, pest management and climate-resilient crops. Along with universities, colleges are a key partner in applied skills training.

**Industry Groups:** Organizations that represent farmers, producers, agriculture suppliers, food processors and other agricultural stakeholders such as non-government international partners play an intermediary role, supporting R&D efforts and facilitating knowledge transfer.

These various players are crucial for ensuring that the research conducted is relevant, applicable and capable of addressing real-world agricultural challenges.

## CATEGORIES OF AGRICULTURAL RESEARCH

The research conducted in Canada's agriculture sector generally falls into three main categories:

**Basic Research:** This type of research focuses on understanding the fundamental biological, chemical and ecological processes underlying agricultural systems. Key areas include soil microbiology, genetics and plant physiology.

**Applied Research:** Applied research aims to develop practical solutions to agricultural challenges. Innovations in pest management, precision farming and food safety are central to this category.

**In-Field Research:** In-field research involves testing and implementing new technologies and practices directly on farms to assess their effectiveness in real-world conditions. This category bridges the gap between lab-based discoveries and on-the-ground application.

Together, these research areas drive the continued development of Canada's agricultural capabilities, helping to improve productivity, reduce environmental impacts and ensure food security.

## RECENT TRENDS IN GOVERNMENT AGRICULTURAL PROGRAMS AND R&D FUNDING

Over the past decade, Canada has invested heavily in agricultural R&D through several key programs designed to foster innovation, sustainability and global competitiveness. These initiatives include:

- **Growing Forward 2 (GF2) (2013–2018):** This program allocated $3 billion to enhance competitiveness, market development and innovation in the agriculture sector (AIC 2017; AAFC 2017).

- **Canadian Agricultural Partnership (CAP) (2018–2023):** Following GF2, CAP continued the focus on innovation, sustainability and market development, maintaining a $3-billion budget over five years.

Sustainable Canadian Agricultural Partnership (SCAP) (2023–2028): The latest iteration of the agricultural partnership, SCAP added C$500 million to address climate change mitigation and sustainable agricultural growth.

In addition to these government-funded programs, private-sector investments in agriculture, particularly in precision agriculture and biotechnology, have increased significantly. Industry groups and agribusinesses continue to invest in digital tools and innovations aimed at improving productivity while reducing agriculture's environmental footprint.

## WHERE IS CANADA SPENDING ITS AGRICULTURE R&D FUNDS?

Analysis of our 10 years of data (2013–2023), comprised of over 20,000 projects, shows that over the past decade both public and private sector combined spent around C$3.3 billion (adjusted for inflation) on R&D out of the total investment in the sector in that 10-year period. The funding trends highlight that public-sector funding in the Productivity and Growth (P&G), Protection and Risk Resilience (P&RR), and Environmental Stewardship (ES) category has grown significantly, with an annual growth rate of 15.2 per cent. Private-sector investment in this area has also increased, albeit at a slower pace (2.63 per cent annual growth). In contrast, productivity and growth funding has seen a decline in the public sector with an average annual growth rate of 4.56 per cent, with private-sector investments growing by
31.2 per cent. Environmental stewardship has seen substantial growth in both sectors, with public funding rising by 41.2 per cent and private funding increasing by 23.5 per cent. These trends reflect a shift in focus towards sustainability and risk management, driven by both environmental concerns and the increasing complexity of global agricultural systems. (See Figure 1).
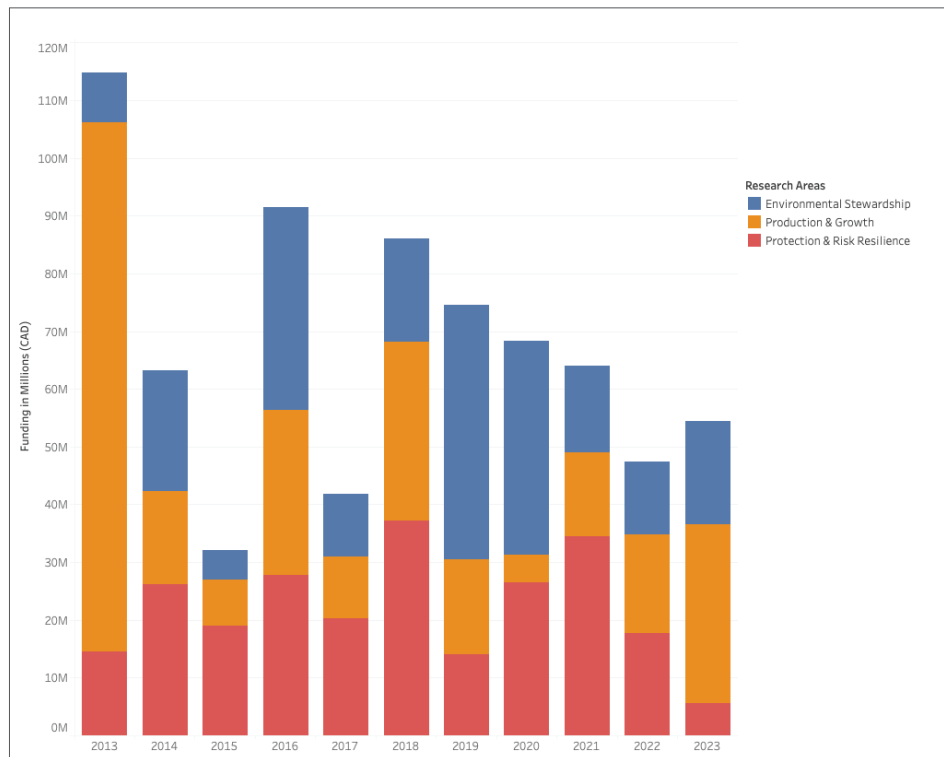
### Figure 1. Public and Private Investment for Agri-Food Research, 2013–2014 to 2022–2023 (adjusted for inflation)
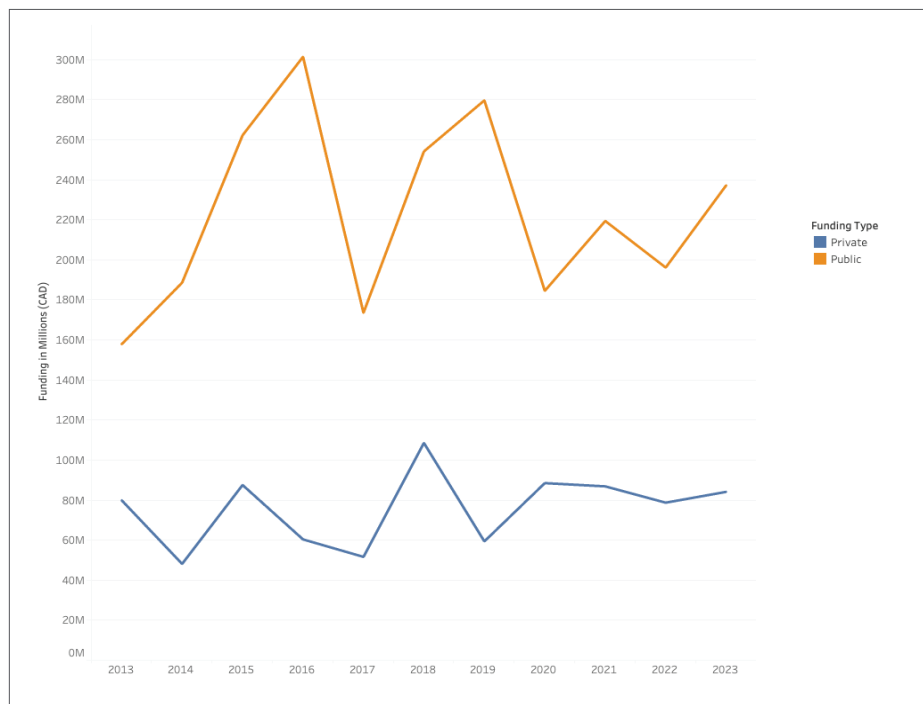
## TRI-COUNCIL AND AAFC INVESTMENT AND ITS ROLE IN AGRI-FOOD RESEARCH

The Tri-Council of Canada, which includes the Natural Sciences and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR), has been instrumental in advancing agricultural research through interdisciplinary funding. Over the past decade, the Tri-Council has invested approximately C$228 million in productivity and growth research, C$200 million in protection and risk resilience and C$195 million in environmental stewardship. These investments have supported a range of projects that aim to enhance agricultural productivity, resilience and sustainability. (See Figure 2).

**Figure 2. Tri-Council (NSERC, SHHRC and CIHR) Investment for Agri-Food Research, 2013–2014 to 2022–2023 (adjusted for inflation)**



AAFC data reveal that, over the past decade, the department has also invested significant amounts into key research areas, including C$186 million in productivity and growth, C$97 million in risk resilience and C$112 million in environmental stewardship. These investments are essential for ensuring that Canada's agricultural sector remains globally competitive and capable of addressing emerging challenges such as climate change and food security. (See Figure 3).

**Figure 3. AAFC Investment for Agri-Food Research,
2013–2014 to 2022–2023 (adjusted for inflation)**
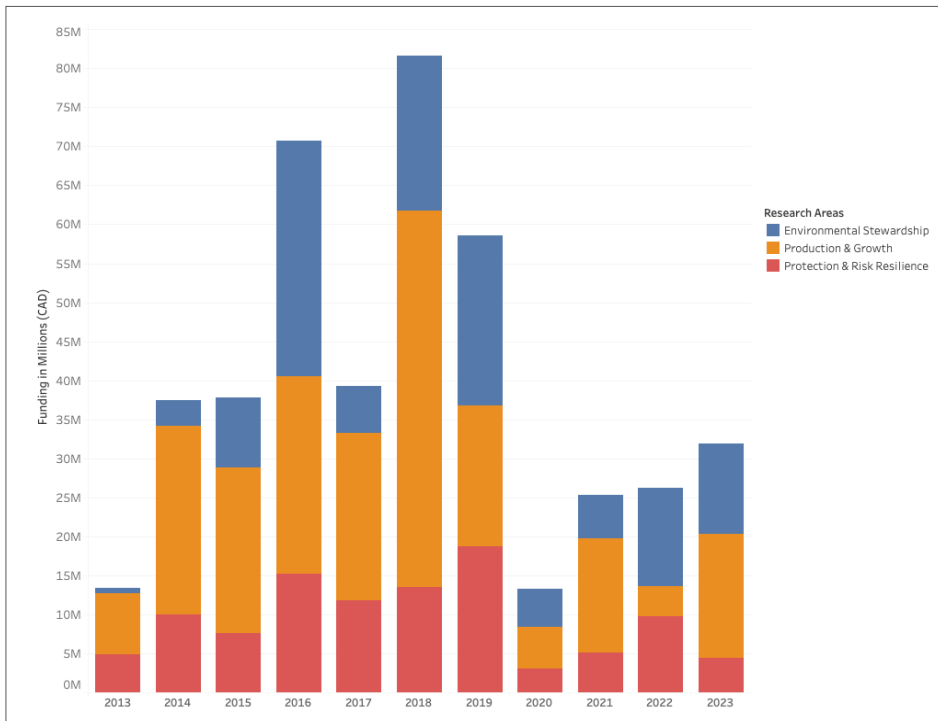


## THE IMPACT OF AGRICULTURAL R&D ON TOTAL FACTOR PRODUCTIVITY

Research funding plays a critical role in improving total factor productivity (TFP) (Statistics Canada 2024) which measures the efficiency of inputs used in agricultural production. The relationship between R&D investment and TFP growth is evident in Canada's agricultural sector, with significant gains observed during the GF2 period (2013–2017). However, a marked slowdown in TFP growth occurred during the subsequent CAP period (2018–2022), with productivity growth falling from five per cent to near zero levels.[1] (See Figure 4).

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[1]   The average annual growth rate for TFP is calculated using total factor productivity data from Statistics Canada's website (Statistics Canada 2024).

Figure 4. Agri-Food Research and Total Factor Productivity Under GF2
and CAP Regime
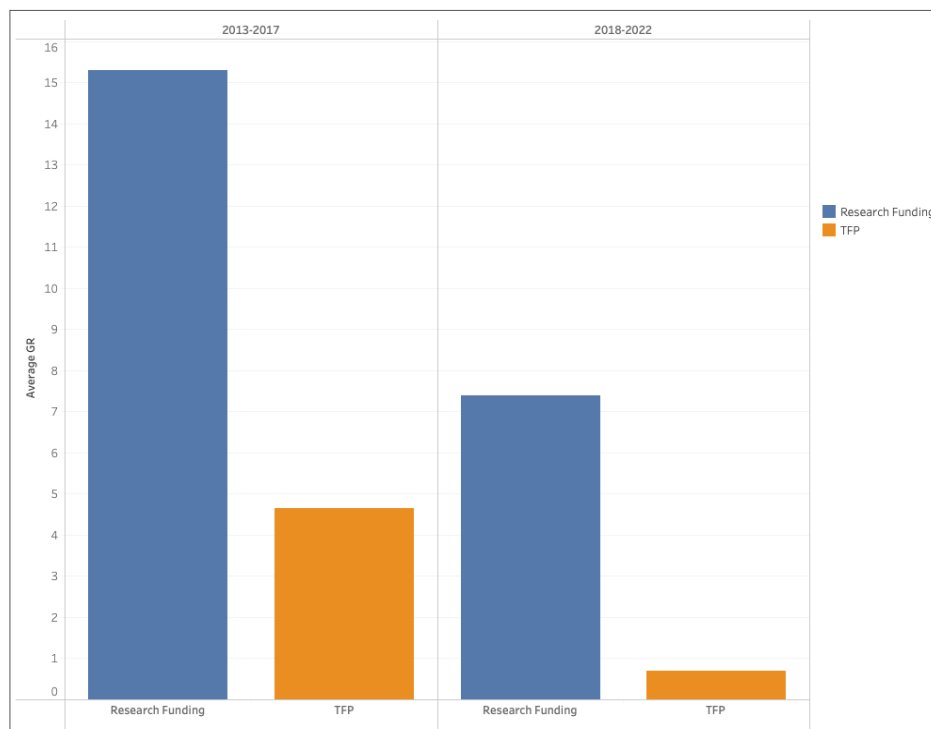


This decline in TFP growth can be attributed to a reduction in the growth of research funding in constant dollars, highlighting the need for greater and more efficient investments in agricultural R&D. Increasing the allocation of funds to high-impact research areas, such as climate-resilient crops and precision agriculture, is essential to reversing this trend and boosting productivity in the sector.

## POLICY RECOMMENDATIONS

1. **Enhance Co-ordination Between Public and Private Sectors:** Develop an integrated, transparent system for tracking R&D funding across both public and private sectors. This will enable policymakers to better understand the funding landscape and ensure that investments are aligned with the most pressing research priorities.

2. **Increase Public Investment in High-Impact Research:** Focus on pre-competitive research that has a direct impact on mitigating climate change and improving agricultural productivity.

3. **Foster Public-Private Partnerships:** Encourage collaboration among public institutions, industry and academic researchers to foster innovation and ensure that new technologies and practices are implemented effectively on farms and in food processing for value addition. These partnerships will facilitate the commercialization of research outcomes and support the development of a competitive agri-food industry.

4. **Focus on Climate-Smart Agriculture:** Allocate more resources to research focused on climate-resilient crops, precision agriculture and technologies that reduce farming's carbon footprint. This will ensure that the sector can adapt to changing climate conditions while maintaining productivity and enhancing Canada's trade competitiveness.

5. **Strengthen Workforce Development:** Align R&D investments with workforce development programs to ensure that farmers and agricultural and food workers are equipped with the skills and knowledge necessary to adopt and implement new technologies and practices.

## CONCLUSION

The Canadian agriculture and food sector is at a juncture for the Canadian economy. To ensure its long-term viability, sustainability and global competitiveness, it is essential to increase investments in agricultural R&D. By enhancing co-ordination between the public and private sectors, focusing on high-impact research and fostering collaboration across various stakeholders, Canada can drive innovation and sustainability in the agriculture sector. The recommendations outlined in this report provide a roadmap for strengthening Canada's agricultural R&D ecosystem, ensuring that it remains capable of meeting the challenges of the future while contributing to global food security and environmental sustainability.

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