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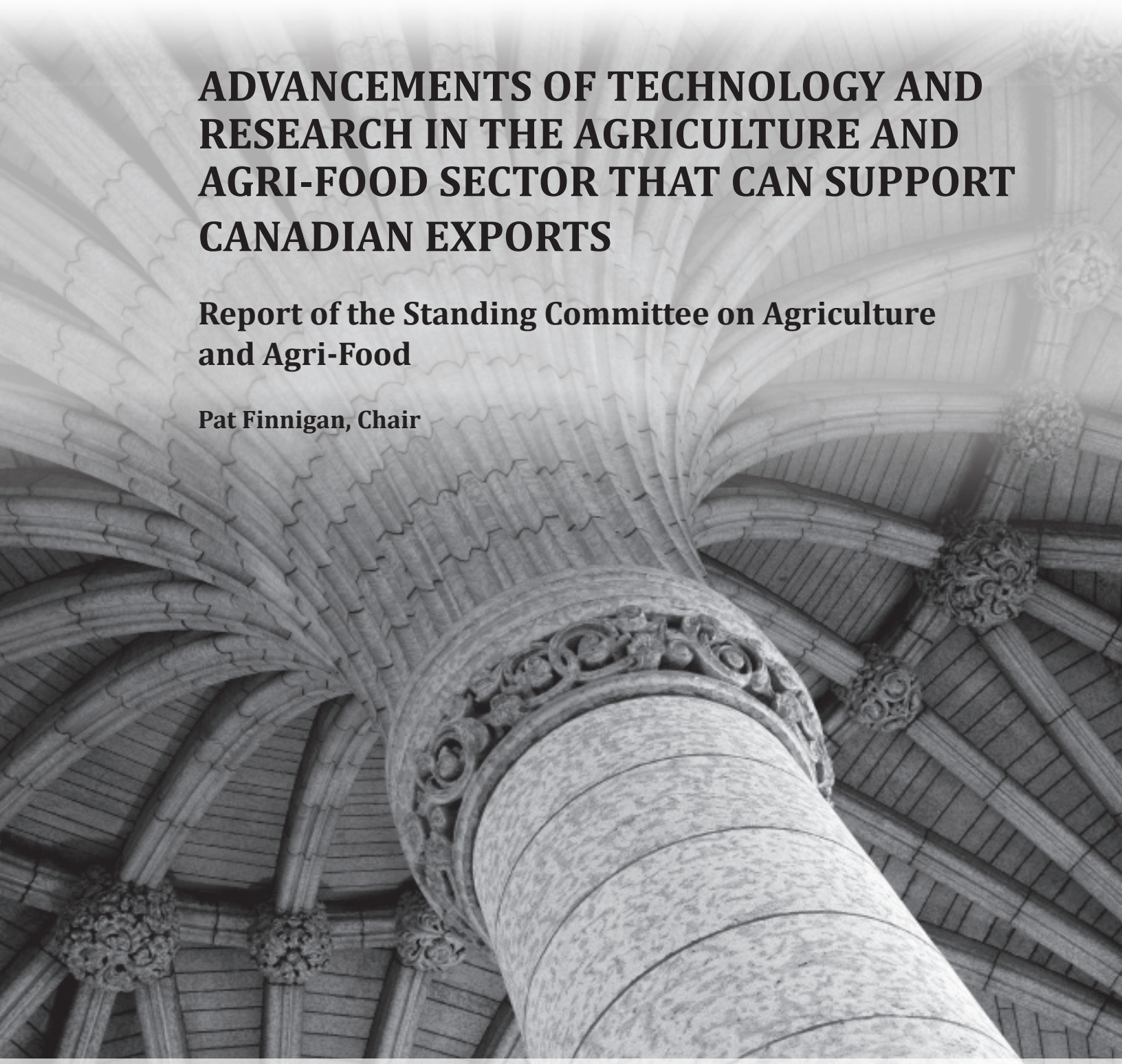
ADVANCEMENTS OF TECHNOLOGY AND RESEARCH IN THE AGRICULTURE AND AGRI-FOOD SECTOR THAT CAN SUPPORT CANADIAN EXPORTS

Report of the Standing Committee on Agriculture and Agri-Food

Pat Finnigan, Chair



JANUARY 2019
42nd PARLIAMENT, 1st SESSION

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Reports from committee presented to the House of Commons

Presenting a report to the House is the way a committee makes public its findings and recommendations on a particular topic. Substantive reports on a subject-matter study usually contain a synopsis of the testimony heard, the recommendations made by the committee, as well as the reasons for those recommendations.

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THE STANDING COMMITTEE ON AGRICULTURE AND AGRI-FOOD

has the honour to present its

FIFTEENTH REPORT

Pursuant to its mandate under Standing Order 108(2), the Committee has studied the Advancements of Technology and Research in the Agriculture Industry that can Support Canadian Exports and has agreed to report the following:

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SUMMARY

Adopting new technologies is a major driver of growth in the agriculture and agri-food sector. That is why, from 21 March 2018 to 20 September 2018, the House of Commons Standing Committee on Agriculture and Agri-food studied technological advancements and research in the agriculture sector and how they can support Canadian exports. The Committee heard from 25 witnesses and received 13 briefs. Committee members also traveled to Quebec, Ontario, Saskatchewan and British Columbia to meet with sector stakeholders.

This report presents the main international trade issues facing the Canadian agriculture and agri-food sector, including access to foreign markets, transportation and labour issues, and reviews the new technologies that could improve the sector's competitiveness. However, the report stresses that the sector will only be able to reap the full benefits of these new technologies if certain obstacles are overcome, such as restricted Internet access in rural areas, the sometimes prohibitive cost of technology and the lack of investment, which jeopardizes some projects even before they are commercialized.

The report also examines the role of government in this context. Among its recommendations, the Committee proposes that the government should maintain a favourable investment climate, provide a transparent, predictable and timely regulatory framework, and promote science-based rules internationally. Finally, the report argues that it is also the government’s role to foster collaboration with industry and academia, both within Canada and internationally, in order to support innovation.

LIST OF RECOMMENDATIONS

As a result of their deliberations committees may make recommendations which they include in their reports for the consideration of the House of Commons or the Government. Recommendations related to this study are listed below.

ADVANCEMENTS OF TECHNOLOGY AND RESEARCH IN THE AGRICULTURE AND AGRI-FOOD SECTOR THAT CAN SUPPORT CANADIAN EXPORTS

INTRODUCTION

On 6 December 2016, the House of Commons Standing Committee on Agriculture and Agri-Food (the Committee) agreed to undertake a study on the advancements of technology and research in the agriculture and agri-food sector.[1] On 31 January 2018, the Committee rescinded the motion adopted on 6 December 2016 and replaced it with the following:

> That the Committee conduct a study of the advancements of technology and research in the agriculture industry, particularly as related to agricultural machinery, and bio-technology, in order to gather feedback from pertinent industries regarding the value of such advancements to the agricultural sector and the most effective allocation of new or current funding, in order to increase Canada's Agri-Food exports to $75 billion per year by 2025.[2]

The Committee held six meetings between 21 March 2018 and 20 September 2018 during which, it heard from various agriculture and agri-food stakeholders. Witnesses included representatives from the Department of Agriculture and Agri-Food, scientists, groups of farmers and representatives from the farm equipment industry.

As part of its study, the Committee travelled to the provinces of Quebec, Ontario, Saskatchewan and British Columbia from 7 May to 10 May 2018. During its trip, the Committee visited processing plants, university research facilities, farm equipment companies and rail and port infrastructure.

The Committee would like to express its sincere thanks to all the witnesses who participated in this study. Based on the evidence heard, the Committee is pleased to present this report with its observations and recommendations.

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1 House of Commons, Standing Committee on Agriculture and Agri-Food (AGRI), *Minutes of Proceedings*, 42nd Parliament, 1st Session, 6 December 2016.

2 House of Commons, AGRI, *Minutes of Proceedings*, 42nd Parliament, 1st Session, 31 January 2018.

INTERNATIONAL TRADE: DRIVER OF ECONOMIC GROWTH FOR THE CANADIAN AGRICULTURE AND AGRI-FOOD SECTOR

In 2017, the Advisory Council on Economic Growth recommended taking steps to enable Canada to be the world's second-largest agriculture exporter and fifth-largest agri-food exporter.[3] A target of $75 billion in exports to be reached by 2025 was established in the report of the Economic Strategy Tables for the agri-food sector.[4] Various witnesses who participated in the study indicated that this target could be achieved, but it is contingent on resolving current international trade issues.[5] Expanding access to foreign markets, maintaining a reliable and effective transport infrastructure and having access to an adequate and qualified labour force are the key challenges Canada must address to achieve this objective.

A. Canada's Trade Relationships

Canada's agriculture sector is highly export-oriented. In 2016, Canada exported $56 billion in agriculture and agri-food products around the world, according to Agriculture and Agri-Food Canada.[6] The United States is the top importer of agriculture and agri-food products, with 53% of Canadian agriculture and agri-food exports going to the U.S. in 2016. China, Japan and the European Union are also major markets for Canadian products, importing nearly one quarter of Canada's agriculture and agri-food exports among them.[7]

Some sectors export more than others. According to Serge Buy of the Agricultural Institute of Canada, 90% of canola and 95% of pulses grown in Canada are exported.[8] According to the Canola Council of Canada, Canada exports canola products to more than 50 countries, and the United States is the biggest market for Canadian exports.[9]

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3 Advisory Council on Economic Growth, *Unleashing the Growth Potential of Key Sectors*, 6 February 2017.

4 Canada's Economic Strategy Tables, *Agri-Food*, 18 February 2018.

5 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1605 (Pierre Petelle, President and Chief Executive Officer, CropLife Canada).

6 Agriculture and Agri-Food Canada, *An Overview of the Canadian Agriculture and Agri-Food System 2017*, Ottawa, November 2017, p. 8.

7 Ibid., p. 51.

8 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 May 2018, 1610 (Serge Buy, Chief Executive Officer, Agricultural Institute of Canada).

9 Canola council of Canada, *Industry overview*.

Canadian pulses are exported to 130 countries,[10] with India being the largest market.[11] Various witnesses pointed out that forecasts for global population growth mean opportunities for Canada, which produces far more agriculture and agri-food products than it consumes. However, the situation is not without its challenges:

> When you look at the world we [*sic*] see a global population growth. We expect to be somewhere in the nine billion person area probably within the next 30 to 40 years, maybe even more, maybe 10 billion. That brings with it some enormous challenges, not the least of which is how we feed all of those people on a landmass that is shifting on us, in the sense that some land is becoming less available and some land is becoming more available. Part of the reason for that is the climate is changing.[12]

Krista Thomas, a representative of the Canadian Grains Council, believes that innovation will continue to help the agriculture and agri-food sector adapt to climate change, reduce food waste and become more environmentally sustainable.[13] However, Leanne Fischbuch, a representative of the Alberta Pulse Growers Commission, is concerned that imposing carbon taxes on the Canadian agriculture sector that are not imposed on the agriculture sectors in other countries could affect Canada's exports competitiveness.[14]

Canadian agriculture continues to rely on existing energy sources such as fossil fuels to remain competitive on the international stage, however farmers are custodians of the land and no industry contributes more to the sequestration of carbon than the agricultural sector. Their innovation and research efforts with carbon sequestration and clean energy technologies should be recognized and supported as a major contributor in the reduction of greenhouse gas emissions as Canadian agriculture products move from farm to fork.[15]

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10 Pulse Canada, *Keep it clean*.

11 Government of Canada, Trade Data Online.

12 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 0845 (Andrew Casey, President and Chief Executive Officer, BIOTECanada).

13 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1535 (Krista Thomas, Director of Plant Innovation, Canada Grains Council).

14 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 1000 (Leanne Fischbuch, Executive Director, Alberta Pulse Growers Commission).

15 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 May 2018, 1625 (Brian Innes, Vice-President, Public Affairs, Canola Council of Canada).

Recommendation 1—Reducing the carbon footprint of the agricultural sector

The Committee recommends that the Government of Canada incentivize the Canadian agriculture sector's efforts to reduce its carbon footprint.

Recommendation 2—Creation of a technology monitoring initiative

The Committee recommends that the Department of Agriculture and Agri-Food institute a technology monitoring initiative to identify growth opportunities for the agriculture sector in international markets.

B. Challenges Associated with Infrastructure and Access to Labour

A number of witnesses shared their concerns about rail transportation in Western Canada. In their experience, the rail system must be reliable and efficient if Canada is to meet its objectives to increase exports, particularly for grain. Leanne Fischbuch indicated that delays undermine Canada's credibility with its international partners:

> Canada's reputation as a leader in global exports is easily compromised when product is unable to move to market. Systemic rail transportation failure has eroded Canada's brand and trust from international customers of our agricultural commodities.[16]

On its trip to Western Canada, the Committee discussed the effectiveness of the Canadian transport system with rail and port representatives. The Committee visited the GrainsConnect grain elevator in Maymont, Saskatchewan, which has a loop track system that can hold over 100 cars.[17] GrainsConnect told the Committee that this technology, combined with the fact that the company has its own fleet of cars, has helped grain farmers become less dependent on the major rail companies, Canadian National and Canadian Pacific. The Committee also visited the port of Vancouver, where similar facilities are being built.

Tyler Hopson of Mosaic, a company that is the world's largest combined producer and marketer of concentrated potash and phosphate fertilizers, acknowledged that concerns

16 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 0955 (Leanne Fischbuch).

17 GrainsConnect Canada, *Are you connected?*.

about rail transportation affect not only the grain sector but also the crop inputs sector.[18]

> The last several years in particular have been characterized by challenging conditions in agricultural and broader commodities markets. Adding to those challenges are the difficulties we've seen with rail transportation across Canada this year. Potash is Canada's largest mineral export, both by volume and in economic terms, so a reliable, safe rail transport system is absolutely critical to ensuring that exports can not only continue, but continue to grow. As it stands, 95% of Mosaic's potash is exported from Canada each year, almost half of which is shipped to offshore customers through Canpotex, the international marketing agency.[19]

Tom Rosser, from Agriculture and Agri-Food Canada, explained to the Committee that grain harvests are increasing every year, and investments must be made to ensure the transport system can grow at the same rate.[20] Therefore, the 2017 federal budget allocated $2 billion over 11 years to the National Trade Corridors Fund. This fund is intended to reduce bottlenecks at Canadian ports of entry, especially Vancouver and Montreal.[21]

Recommendation 3—Transportation to export markets

The Committee recommends that the Government of Canada increase capacity for transporting and shipping exports, particularly grain, and communicate infrastructure investments and planned results.

The labour shortage is another barrier to increasing exports in the agriculture and agri-food sector. While significant productivity increases have been recorded in a number of areas, some sectors continue to rely heavily on manual labour. According to Rory McAlpine of Maple Leaf Foods, while the meat processing sector extensively uses automation already, hands-on labour is still required for the fine trimming and deboning steps, which are also the steps where the most value is added.[22] The labour shortages can also have an impact on the farmers' ability to innovate and adopt new technologies.

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18 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 0855 (Tyler Hopson, Public Affairs Manager, Mosaic).

19 Ibid.

20 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1645 (Tom Rosser, Assistant Deputy Minister, Strategic Policy Branch, Department of Agriculture and Agri-Food).

21 Government of Canada, *Chapter 2—Communities Built for Change*.

22 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 June 2018, 1605 (Rory McAlpine, Senior Vice-President, Government and Industry Relations, Maple Leaf Foods Inc.).

> A farm that is struggling financially or cannot fill its labour requirements is not positioned for innovation and investment — to try something new with potentially negative consequences, even if just in the short term.[23]

The Temporary Foreign Worker Program helps address the labour shortage in the agriculture and agri-food sector. However, the program is subject to certain requirements. For example, employers in the processing sector are not allowed to hire more than 10% of their workers through this program.[24]

One of the issues raised by witnesses is the challenge of attracting the next generation of agriculture and agri-food workers. Representatives of Colleges and Institutes Canada suggested that work-integrated learning would help attract young people to the sector by giving them a chance to see the potential for their future careers.[25] Stuart Cullum added:

> We're able to attract a lot of young people into this industry who aren't from the farm, which is important, because they see it as a place where they can be an IT expert, a business systems expert, or an artificial intelligence expert. It's not just about agriculture anymore. It's about how they apply that passion in a sector that is going to be a future economic generator for our country.[26]

Recommendation 4—Promotion of job opportunities in the sector

The Committee recommends that the Government of Canada undertake a campaign to promote high-tech job opportunities in the agriculture sector to Canadian youth.

According to a brief submitted by the Association of Equipment Manufacturers (AEM), the sector is also affected by a skills gap, especially in positions for equipment service technicians and operators.[27] Howard Mains, an AEM representative, emphasized this

23 Farm Management Canada, *Presentation to the Standing Committee on Agriculture*, 6 June 2018.

24 Government of Canada, Employment and Social Development Canada, Program requirements for low-wage positions.

25 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 0905 (Christine Trauttmansdorff, Vice-President, Government Relations and Canadian Partnerships, Colleges and Institutes Canada).

26 Ibid., 0850 (Stuart Cullum, President, Olds College, Colleges and Institutes Canada).

27 Association of Equipment Manufacturers, Presentation by: Association of Equipment Manufacturers, 11 June 2018.

point when he appeared before the Committee, adding that agriculture equipment manufacturers need engineers to design the equipment and welders to build it.[28]

Recommendation 5—Labour shortages

The Committee recommends that the Government of Canada address labour shortages to increase capacity in food processing, equipment manufacturing, and in primary agriculture, year-round and seasonally.

C. Maintaining and Improving Access to International Markets

Many witnesses indicated that issues involving access to international markets must be addressed if Canadian exports are to be maintained and increased. Non-tariff barriers were identified time and again as a major source of concern. In fact, the Committee carried out a study on non-tariff trade barriers in November 2017.[29] Jean-Marc Ruest, representing Richardson International Limited, gave the following definition of these barriers:

> While the most obvious trade barriers are typically monetary tariffs imposed on imports, in agriculture, equally effective if not better barriers are the non-tariff trade barriers, which often manifest themselves through phytosanitary regulations or technology approval processes. For example, countries will use their domestic regulations to limit the quantities of pesticide residues—known as maximum residue levels or MRLs—on Canadian crops to impossibly low levels as a means of preventing the entry of Canadian crops, usually at times when the importing country has a domestic production surplus.[30]

Witnesses shared their concerns about specific issues. For example, CropLife Canada and the Alberta Pulse Growers Association mentioned that Canadian pulse growers have trouble dealing with changing Indian regulations on fumigating imported pulses.[31] Brian Innes, Vice-President of Public Affairs at the Canola Council of Canada, informed the Committee that the canola industry was trying to obtain Chinese approval for canola

28 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 1020 (Howard Mains, Canadian Public Policy Advisor, Association of Equipment Manufacturers).

29 House of Commons, AGRI, Non-tariff Trade Barriers to the Sale of Agricultural products in Relation to Free Trade Agreements, 42nd Parliament, 1st Session, November 2017.

30 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 0900 (Jean-Marc Ruest, Senior Vice-President, Corporate Affairs and General Counsel, Richardson International Limited).

31 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 0955 (Leanne Fischbuch).

seed traits developed using biotechnology.[32] Lastly, concerns were raised about non-tariff barriers on Canadian durum wheat imported by Italy.[33]

Some witnesses said that Canada must continue to promote international science-based standards as a way to address non-tariff barriers.[34]

> Canada is respected around the world for its strong science-based regulatory system when it comes to agriculture and food. This commitment to science-based regulation must continue, and we must seize opportunities to improve the efficiencies and streamline regulatory approaches where possible to drive greater innovation and competitiveness.[35]

The Canada Grains Council recognized the work of federal government staff, who support the industry in advocating abroad when this type of problem arises.[36] Leanne Fischbuch suggested that recognition of scientific standards and global harmonization should be priorities for the Canadian Food Inspection Agency. She also mentioned the importance of Canada's involvement in bodies such as the Codex Alimentarius Commission, which develops international standards for maximum residue limits.[37] CropLife Canada highlighted the importance of giving the federal bodies responsible for representing Canada in these forums the resources they need to carry out their mandates.[38]

According to Serge Buy, trade agreements finalized in the last 10 years have opened new export markets.[39] Witnesses indicated that Canada should continue trying to reach trade agreements with its largest trade partners to increase its access to agriculture and agri-food markets, particularly in the United States and China.

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32 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 May 2018, 1620 (Brian Innes).

33 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1530 (Pierre Petelle).

34 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 June 2018, 1640 (Rory McAlpine).

35 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1530 (Pierre Petelle).

36 Ibid., 1605 (Krista Thomas).

37 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 1000 (Leanne Fischbuch).

38 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1610 (Pierre Petelle).

39 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 May 2018, 1610 (Serge Buy).

Recommendation 6—Harmonization of regulatory requirements

The Committee recommends that the Government of Canada enhance regulatory cooperation with its foreign partners to harmonize science-based regulatory requirements.

Recommendation 7—Providing resources to support Canadian exporters

The Committee recommends that the Government of Canada provide the appropriate resources to support Canadian exporters by promoting the harmonization of science-based regulatory requirements within foreign jurisdictions.

TECHNOLOGICAL ADVANCEMENTS IN THE SECTOR

New technologies are one of the drivers of growth in the agriculture and agri-food sector. They may increase productivity, performance or efficiency, and they can also be used to help develop new products. Tom Rosser provided details on the target established in the 2017 federal budget to grow agriculture and agri-food exports to $75 billion by 2025:

> Advancements in technology and research, particularly those transformative in nature, such as artificial intelligence, the bioeconomy, and the latest in breeding technologies, will be critical in helping to increase Canada's agri-food exports to meet this new target.[40]

In Guelph, the Committee saw examples of innovation during its visits to the Bioproducts Discovery and Development Centre (BDDC) and Semex. The BDDC is an interdisciplinary centre where plant biologists, chemists and engineers collaborate to develop products using crops and crop residues. Semex is a company that develops and markets genetic material for use in bovine artificial insemination.

A. Overview of New Technologies

The field of biotechnology is full of innovations with a variety of applications. During his appearance before the Committee, the representative from BIOTECanada, Andrew Casey, gave the example of genetically modified mustard seeds that can be grown in areas that would otherwise be unsuitable for these crops. The harvested seed can then be used in the food industry and as a biofuel.[41] Representatives of Prograin, a company

40 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1635 (Tom Rosser).

41 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 0845 (Andrew Casey).

that specializes in soybean development, packaging, processing and marketing, told the Committee that technology means added value for farmers. Prograin develops varieties with characteristics that are prized on the local and international markets. On a visit to Prograin's genotyping laboratory, the Committee observed that the company's research requires technologically advanced equipment.

Many witnesses indicated that recently developed gene-editing technologies, particularly CRISPR-Cas9, are very promising. These technologies can be used to improve herbicide tolerance, help fight some parasites, and increase yields. According to Krista Thomas, gene-editing technologies are different from biotechnologies used to create genetically modified organisms (GMOs) because they are very precise and new crop varieties can be developed in 2 years instead of the 10 years it takes for GMOs.[42] However, because the technology is new, the regulatory framework governing gene editing in Canada is still unclear. A number of witnesses said that discussions about how this technology should be regulated are taking place at both the national and international level.

> [T]hat's the discussion we're having with officials … that we think there are different tiers of approaches to take with these gene-edited products, everything from a full assessment, just like a biotech crop with foreign DNA, right down to either no regulation at all to different layers in between. I think even that would be a great improvement, because then we would know what those tiers are, and again, it would provide that predictability, and we would know approximately the time required for each of those levels.[43]

Research is also being conducted in the organic production sector. Brian Gray of Agriculture and Agri-Food Canada said that certain experimental farms and research and development centres focus on organic farming. For example, the Harrow Research and Development Centre is working to develop new organic soybean varieties. On its trip to Western Canada, the Committee visited a farm run by the University of British Columbia's Centre for Sustainable Food Systems. This certified organic farm is a living laboratory used to conduct research spanning the entire agri-food chain.

Recommendation 8—Support for agriculture and agri-food businesses

The Committee recommends that the Government of Canada support initiatives for the establishment, start-up and growth of agriculture and agri-food businesses using new technologies.

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42 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April, 2018, 1535 (Krista Thomas).

43 Ibid., 1555.

Witnesses also said that the use of precision agriculture was promising for the future of Canadian agriculture. Precision agriculture technologies can increase the industry productivity and reduce its environmental footprint. For instance, according to Gregor MacLean, precision agriculture can result in 5% to 10% costs savings on fertilizer, as well as increased yields.[44]

> Precision agriculture can be broadly defined as a management strategy that uses a wide range of technologies to guide targeted actions. In essence, it tries to take the intuition and guesswork out of farming by allowing producers to harness the power of big data. For example, new precision farming technologies are helping farmers reduce pesticide and fertilizer usage. Farmers are checking their animals from their smartphones and mapping their fields with the power of big data. They're making decisions about harvesting their crops based on satellite imagery.[45]

Howard Mains gave a presentation on the applications of precision agriculture, such as the ability to selectively apply fertilizers and pesticides by using mapping tools and cameras.[46] Precision agriculture relies on tools to monitor and share data, such as weather stations, GPS capacity, Wi-Fi connectivity and data visualization.[47] Precision agriculture also integrates new technologies such as big data and artificial intelligence, which help users analyze increasingly large volumes of data.[48]

The Committee also heard about other promising technologies in the agriculture and agri-food sector. According to representatives from Agriculture and Agri-Food Canada, blockchain technology,[49] which is a very secure, decentralized database, could be used to improve food traceability in the supply chain. Products with better traceability can

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44 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 1010 (Gregor MacLean, (Research Project Manager, Research and Innovation, Niagara College).

45 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1640 (Tom Rosser).

46 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 1015 (Howard Mains).

47 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 0850 (Stuart Cullum).

48 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1640 (Tom Rosser).

49 A blockchain is a write-only database dispersed over a network of interconnected computers that uses cryptography (the computerized encoding and decoding of information) to create a tamperproof public record of transactions. Blockchain technology is transparent, secure and decentralised, meaning no central actor can alter the public record.

command a higher premium in markets that value certification, such as China and Japan.[50]

Artificial intelligence (AI) technologies, particularly machine learning, are used to automatically identify trends by analyzing large quantities of data generated by the aforementioned technologies.[51]

> Artificial intelligence is also known as "machine learning", and instead of humans programming algorithms that then go out and look, these are algorithms that can go out and learn and build their own algorithms. AI will see patterns that we are not possibly able to see. It will come back, and if those patterns are something that register, it keeps learning and building. Human beings cannot possibly pick up the patterns of 350 data points simultaneously—if it were two, three, or four, then maybe. The exciting part of AI is the ability of these systems to discover patterns that we never thought of and things that just would not ever be intuitive to you.[52]

Recommendation 9—New regulations

The Committee recommends that the Canadian Food Inspection Agency and Pest Management Regulatory Agency modernize regulatory approval processes and improve their performance.

B. Internet Access Needed for Many New Technologies

In 2016, the Canadian Radio-television and Telecommunications Commission estimated that approximately 18% of Canadian households, mostly in rural areas, do not have access to broadband Internet.[53] While more recent data was not available, various witnesses said that broadband Internet access in rural areas is still a challenge for farmers. It is thus difficult for them to adopt new technologies that require broadband Internet access.

> It all comes down to good connectivity. Without a reliable, consistent and affordable high-speed Internet connection, these technologies are just not available. In 2016 it was

50 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1655 (Marco Valicenti, Director General, Sector Development and Analysis Directorate, Market and Industry Service Branch, Department of Agriculture and Agri-Food).

51 Ibid., 1705 (Brian Gray, Assistant Deputy Minister, Science and Technology Branch, Department of Agriculture and Agri-Food).

52 Ibid.

53 Canadian Radio-television and Telecommunications Commission, *CRTC Submission to the Government of Canada's* Innovation *Agenda*, 2016.

> reported that 82% of Canadians had access to broadband. The remaining 18% were largely in rural communities, leaving many producers without reliable access.[54]

Precision agriculture involves collecting data directly from crops or animals and sharing that information rapidly with computers capable of analyzing the data. Howard Mains noted that the ownership of data is an emerging issue, given that more and more data is being collected. Smartphones and tablets, which rely heavily on wireless technologies, are critical to precision agriculture.[55] In Serge Buy's opinion, not having a broadband Internet connection is a major obstacle for farmers, as they are unable to use technologies that could make their products more desirable to international markets.[56]

Witnesses identified a number of possible solutions, Ray Orb, President of the Saskatchewan Association of Rural Municipalities, mentioned that federal programs such as "Connecting Canadians" could help improve broadband Internet coverage.[57] Howard Mains pointed out that the agriculture equipment industry was looking into developing equipment that could work at slower Internet speeds, so farmers could benefit from new technologies even with a limited Internet connection.[58]

> Broadband Internet access has become fundamental to modern life and has the power to transform rural Canada. Modern networks contribute to economic growth by improving productivity, providing new services, supporting innovation and improving market access, especially in the agriculture industry.[59]

Recommendation 10—Access to broadband Internet

The Committee recommends that the Government of Canada continue to improve access to broadband Internet in rural farming communities by further investing and provide transparency on existing planned coverage.

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54 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 1005 (Ray Orb, President of the Saskatchewan Association of Rural Municipalities).

55 Canadian Federation of Agriculture, *CFA Submission to the Standing Committee on Agriculture and Agri-Food*, 27 June 2018.

56 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 May 2018, 1610 (Serge Buy).

57 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 1030 (Ray Orb).

58 Ibid., 1010 (Howard Mains).

59 Ibid., 1005 (Ray Orb).

C. Challenges to Innovation and the Development of New Technologies

Witnesses stated that there are several barriers to innovation that must be overcome to achieve export targets. These obstacles could hinder the success of Canada's agriculture and agri-food sector.

> Innovative technologies are consistently being developed and used across the sector, but there are barriers that continue to inhibit them from attaining their full potential. These barriers include the overall cost of investment, insufficient infrastructure, undeveloped supply chains, and a lack of training or professionals to work through the complexities of adoption, among others.[60]

1. Technology-related Costs

The Committee heard that the costs and risks involved in developing new technologies are a major barrier to innovation. Rory McAlpine stated that the food processing industry requires huge investments given the cost of the latest technology. A large market share is needed to justify the purchase of expensive equipment.[61] To help farmers acquire the most innovative farm equipment, the Canadian Federation of Agriculture (FCA) suggested introducing a first-year depreciation deduction for new farm equipment. A similar measure already exists in the United States, so Canadian farmers are at a disadvantage compared with their American competitors. The CFA believes that introducing this measure in Canada could encourage investment in innovation and recommends in general that the *Income Tax Act* be reviewed.[62]

Recommendation 11—Deduction for the acquisition of new farm equipment

The Committee recommends that the Government of Canada create an expedited tax deduction process for the acquisition of new agricultural equipment.

60 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1630 (Tom Rosser).

61 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 June 2018, 1545 (Rory McAlpine).

62 Canadian Federation of Agriculture, *CFA Submission to the Standing Committee on Agriculture and Agri-Food*, 27 June 2018.

Recommendation 12—Review of Canada's *Income Tax Act*

The Committee recommends that the Government of Canada review Canada's *Income Tax Act* to address the competitive imbalance between Canadian farmers and Canada's main trade partners.

Witnesses also described how hard it is for small companies with limited budgets to buy costly equipment. However, food processing development centres are available to help them develop new product lines. During its trip to Saskatoon, the Committee visited the Saskatchewan Food Industry Development Centre, which offers services and facilities to companies that want to develop value-added products for domestic and international markets. Similarly, the Food Processing Development Centre, in Leduc, Saskatchewan, helps small businesses pilot their products.[63] The Committee noted that few people are aware of the existence of these business incubators, which provide various types of support, such as advisory services and mentoring, to help start-up companies.

BioFoodTech, based in Prince Edward Island, helps companies move from the concept phase through to the piloting and marketing phases. Jim Smith of BioFoodTech explained that his organization helps companies determine whether their ideas have potential and then works with them from concept to results.[64]

Despite the existence of food technology centres to help companies develop their products, Jim Smith stated that several factors are impeding innovation in Canada.

> [W]e basically don't have a strong culture of innovation within the value-added food processing industry, and 90% of the companies do not have a relationship with the food technology centres to help them to develop new products. One of the issues caused by that is that there's a huge trade deficit in value-added food products. According to CAPI, it's $8 billion. There are different measures of that, but it's a big number, and it's growing. Part of that is because of the lack of development and the lack of investment in innovation.[65]

63 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 1020 (Leanne Fischbuch).

64 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1635 (Jim Smith, Executive Director, BioFoodTech).

65 Ibid.

2. Investments in Innovation

Rory McAlpine acknowledged that there are programs to attract investment to Canada, such as the Industrial Research Assistance Program of Canada's National Research Council. However, their impact is limited.[66]

> The program landscape is fragmented, confusing, and in our experience ill-suited to mitigating the costs and risks that deter advanced food plant manufacturing investment in Canada.[67]

Although some witnesses said there was a lack of funding for innovation in Canada, others gave examples of companies that have received excellent financial support. EIO Diagnostics has been in business for less than a year, but has received significant private-sector funding. This company has developed technology for the early detection of illnesses in dairy animals.[68] Most of its funding comes from foreign investors.[69] According to Damir Wallener, Chief Executive Officer of EIO Diagnostics, the company could attract these investors because they tend to be less risk-averse than Canadian backers. In addition to private-sector funding, EIO Diagnostics has received federal support through the Industrial Research Assistance Program at the National Research Council Canada.[70]

Recommendation 13—Simplification of the funding application process

The Committee recommends that the Government of Canada simplify the application process for the Scientific Research and Experimental Development Program to include on-farm research to facilitate access to tax incentives.

Glen Metzner of API Labs Inc. noted that his company, which is working to establish a commercial poppy industry in Canada, received $450,000 in funding from the Canadian Agricultural Adaptation Program.[71] Despite access to private and public sector funding, Glen Metzer and Damir Wallener stated that it is difficult to commercialize their innovations because the regulatory framework hinders the development and growth of their businesses.

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66 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 June 2018, 1550 (Rory McAlpine).

67 Ibid.

68 Ibid., 1535 (Damir Wallener, Chief Executive Officer, EIO Diagnostics).

69 Ibid., 1540.

70 Ibid.

71 Ibid., 1600 (Glen Metzler, Chief Executive Officer, API Labs Inc.).

> We have also raised several times that amount from investors and farmers from the prairies who are eager to add poppy seed to their crop rotation, but since 2015 we've been struggling to get the necessary regulatory approvals from Health Canada for the commercialization of poppy seed cultivation. Health Canada has given us approval to conduct research and development in this sector for the last several years, but they continue to delay and deny approval for us to commercialize.[72]

Recommendation 14—Support to develop new products

The Committee recommends that the Government of Canada improve access and awareness of programs to help companies take new products and technological processes from design to commercialization to export sales and trade services.

THE ROLE OF GOVERNMENT AND THE REGULATORY FRAMEWORK

During public hearings and site visits, the Committee repeatedly heard that the government and the regulatory framework play a vital role in helping Canada achieve its export potential.

A. Effectiveness of the Regulatory Framework

Many witnesses said that the timely regulatory approval of new products is essential if the Canadian agriculture and agri-food sector is to remain competitive. However, the asynchronous approval process — in other words, unsynchronized process for approving new products — between countries disrupts trade.

> [F]rom a regulatory standpoint, one of the things that is very difficult and hurting Canadian exports of products is what I'll call the lack of collaboration with respect to the registration of new technologies in different jurisdictions. We have a Canadian registration process, and then in order to be able to export to other jurisdictions, we need to go through very long regulatory processes, and oftentimes in countries where we have very similar backgrounds and stakes at play. The United States is an example of that. To have to go through again a very long regulatory registration process seems inefficient. We ought to be striving for synchronous approval of new technologies in various countries so we can actually deploy them much more quickly than we currently do.[73]

Although Canada exports most of its production, Pierre Petelle pointed out that we are not a major producer on the world scene. Canada must be a leader in speed to market

72 Ibid., 1550.

73 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 0925 (Jean-Marc Ruest).

and ensure that it has an effective regulatory system in order to compete in the world's largest markets.[74] According to Glen Metzner, his company is losing out on business opportunities because it still has not received Pest Management Regulatory Agency and Canadian Food Inspection Agency approval to commercialize poppy seeds, making Canada the only G7 country that does not commercially produce or process poppies.[75]

Witnesses also emphasized that the lack of regulatory harmonization between countries creates uncertainty and may affect the success of Canada's agriculture and agri-food sector. Before developing new products, it is important to ensure that export markets also accept them.

> Another key consideration is ensuring that our export markets accept the technologies and innovations that have been approved by Canadian regulators and adopted by our growers. When access to export markets is hindered due to delays in regulatory approvals between jurisdictions, it can deter investment in innovation, restrict the adoption of new technologies, and impede exports.[76]

Recommendation 15—Agricultural products regulation review

The Committee recommends that the Minister of Health review how Health Canada regulates agricultural products through the Office of Controlled Substances and coordinate with the Minister of Agriculture to identify and remedy regulatory oversights/overlaps that are inhibiting technological advancement and innovation in the agricultural industry.

Recommendation 16—Evaluation of the procedures and practices of the Department of Agriculture and Agri-food

The Committee recommends that in order to ensure technological advancements and innovation in agriculture are not being hindered, the Minister of Agriculture and Agri-Food undertake an evaluation of its procedures and practices regarding the *Agricultural Growth Act*.

74 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1540 (Pierre Petelle).

75 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 June 2018, 1550 (Glen Metzner).

76 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018,1640 (Paul Thiel, Vice-President, Product Development and Regulatory Science, Bayer CropScience Inc.).

Recommendation 17—Acceptance of products by export markets

The Committee recommends that the Government of Canada resolve irritants and issues that limit innovation and competitiveness in export markets to have them accept domestically approved products or technological processes.

Witnesses emphasized that predictability and speed are the most important factors for success when it comes to innovation. In fact, many witnesses believe that a predictable business environment and a rapid approval process for new products are key to successfully achieving export objectives. Witnesses also stressed the importance of a science-based approval process.

> In order to have predictable and stable trade, Canada needs to promote science-based regulation internationally. To achieve this, we need our scientists to be able to work with scientists in other countries. This means that regulatory agencies like the Canadian Food Inspection Agency and the Pest Management Regulatory Agency need to have both the mandate and the resources to promote science-based trade internationally. Whether it's regulations and standards around food and feed safety, crop protection products, or plant health, enabling more canola exports requires a team Canada approach that includes our scientists.[77]

Recommendation 18—Review of regulatory processes

The Committee recommends that the Pest Management Regulatory Agency undertake a review of its regulatory processes with the aim of evaluating how its procedures may inhibit technological advancement and innovation.

Recommendation 19—Modernizing the regulatory approval process

The Committee recommends that the Pest Management Regulatory Agency and the Canadian Food Inspection Agency modernize, simplify, and speed up the regulatory approval process so companies can take advantage of market opportunities as they arise.

B. Social Perception and Social Acceptability of the Agriculture Sector

Witnesses also shared their concerns about public attitudes to biotechnology products. Jean-Marc Ruest noted that society is ready to accept the use and application of

77 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 May 2018, 1625 (Brian Innes).

technology in a variety of fields, such as aviation, transportation and health care; however, public attitudes are different when it comes to nutrition or food production.[78]

According to witnesses, the public does not understand agricultural and agri-food technologies and is therefore somewhat reluctant to embrace them. However, science can play a role in helping to reassure people. Witnesses were unanimous in saying that the regulatory process must be based on science, not subjectivity, and decisions on product safety must be evidence-based. Paul Thiel of Bayer CropScience criticized the Pest Management Regulatory Agency for its lack of transparency in the re-evaluation process.[79]

> The Pest Management Regulatory Agency's re-evaluation process does not afford an opportunity for registrants or other affected stakeholders to address potential risk concerns prior to the publishing of these proposed re-evaluation decisions. This is unacceptable, as it sends an unclear signal to foreign jurisdictions and can erode public trust both at home and abroad.[80]

Andrew Casey stated that the "government plays a very important role once this technology gets to a point where you're ready to put it into the population."[81] Paul Thiel suggested that the government allocate resources to inform the public about regulatory processes and how regulators make their decisions.[82] However, this is not the sole responsibility of the federal government.[83] Various agriculture and agri-food industries have launched public awareness campaigns to provide reliable information, instill trust and improve attitudes toward the Canadian agriculture and agri-food sector.

> We have a campaign to educate and inform the public about the safety of the technologies that our members produce. We've been working closely with different audiences, the audiences that we consider more influencers rather than consumers directly. Dietitians, agriculture in the classroom, these types of forums allow us to answer questions, and provide information to people who are then asked lots of questions about food and food safety. That's been very useful.[84]

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78 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 0915 (Jean-Marc Ruest).

79 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1650 (Paul Thiel).

80 Ibid.

81 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 0930 (Andrew Casey).

82 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1640 (Paul Thiel).

83 Ibid.

84 Ibid., 1620 (Pierre Petelle).

> That audience has questions about the technology. They don't necessarily have an angst or a fear coming into it, they just don't know. Once they've asked the questions, we provide information, supplemented by good information and defence from the regulators. It makes for a very compelling case.[85]

Simon Dugré of the Centre d'innovation sociale en agriculture, an agency that researches social innovation in agriculture, believes that integrating social innovation and technological innovation at the beginning of a project will help make it successful and encourage social acceptance. In his view, bringing people and science together, for example, by providing them with science-based information, would give people a better understanding of initiatives to develop new products and processes. He defines social innovation as "any idea, approach, intervention, service, product, law or organization that provides an appropriate and sustainable response to a social, economic or environmental need."[86]

Recommendation 20—Bringing science to the public

The Committee recommends that the Government of Canada support knowledge transfer in agriculture to bring science to the public as new agricultural technologies are developed.

Recommendation 21—Public trust

The Committee recommends that the Government of Canada allocate resources to inform the public about regulatory processes, and how regulators make their decisions, and to make this information public.

C. Support for Agricultural Research and Development

The United Nations projects that the world population will reach 9 billion by 2050.[87] This prospect holds many opportunities for Canada, but food production will have to be increased, anticipating demand while taking limited resources into account. Many witnesses believe that innovation is the solution for meeting growing demand. In addition to a favourable investment climate, timely approval and the promotion of

85 Ibid.

86 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 20 September 2018, 0900 (Simon Dugré, Director, Centre d'innovation sociale en agriculture).

87 United Nations organizations, *World Population Prospects*, Key findings & advance tables, 2017 Revision.

science-based rules internationally, witnesses believe that stakeholder partnerships are essential to stimulating export growth, through research and development.

1. Stakeholder Collaboration in the Agri-food Chain

Stakeholders stated that the industry needs to work closely not only with the federal government but also with other countries given that the majority of Canadian production is destined for export markets. Tom Rosser explained that partnerships are part of the Department's approach.

> When it comes to science, AAFC uses an approach based on partnerships, working with industry, universities and colleges, and others to provide the science that enhances the sector's resiliency, fosters new areas of opportunity, and supports sector competitiveness. Partnerships and collaboration leverage federal research investments and bring together necessary capacities across institutions to help focus research on areas of benefit and importance to the sector.[88]

Some witnesses criticized the lack of coordination between departments in the same government, which creates uncertainties that can affect research initiatives. The administrative burden can also hinder the development and use of innovative technology. Witnesses believe that cooperation and communication among stakeholders are vital to stimulating innovation.

> [T]oo often we have instances where the right hand and the left hand don't seem to be communicating. I'll use the neonicotinoid example. Right now we have one branch that seems to be looking at alternatives to neonicotinoids, and at the same time, another branch that is looking to take away the very products that are identified as alternatives. That puts industry in a very difficult position, and more importantly, it puts our customer, the grower, in an extraordinarily difficult position because losing one tool is challenging enough, but losing the alternatives to that tool is even more challenging. Another one that is just finally coming to an end after nearly eight years is Environment Canada coming to us with regulation around plant pathogens and how we're able to use them in research. The Agriculture Canada researchers who were using these very pathogens themselves were unaware of what was coming. Eight years later, we finally have a resolution in place. A lot of it is ensuring that communication across sectors; a sectoral approach to regulation is critically important.[89]

Rory McAlpine said that competition in the food processing sector and the poor potential for profit does not encourage companies to cooperate with one another.[90]

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88 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1635 (Tom Rosser).

89 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 April 2018, 1655 (Paul Thiel).

90 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 June 2018, 1620 (Rory McAlpine).

Serge Buy suggested creating an inclusive demand-driven science-based policy framework. He said that this framework would have to be supported by a whole-of-government approach, not just by one department. Innovation superclusters are an example of this type of collaboration model.[91]

Recommendation 22—Open Information

The Committee recommends that the Government of Canada provide more open access to information for federal research in agriculture and processing.

2. Agricultural Research and Development Programs

As mentioned earlier, significant investment is needed to develop new technologies. In 2017, the federal budget committed to investing in agricultural research and innovation, particularly clean energy. For instance, the federal government is providing $200 million over four years to Agriculture and Agri-Food Canada, Natural Resources Canada, and Fisheries and Oceans Canada to support clean technology research.[92]

The Canadian Agricultural Partnership is a five-year plan to strengthen the agriculture and agri-food sector through a $690-million investment to advance agricultural science and innovation and emphasize sustainable growth. Although the Agricultural Clean Technology Program is not part of the Canadian Agricultural Partnership, it represents an annual investment of $25 million in the agriculture sector. The program aims at reducing greenhouse gases through research, and the development and adoption of clean technologies.[93]

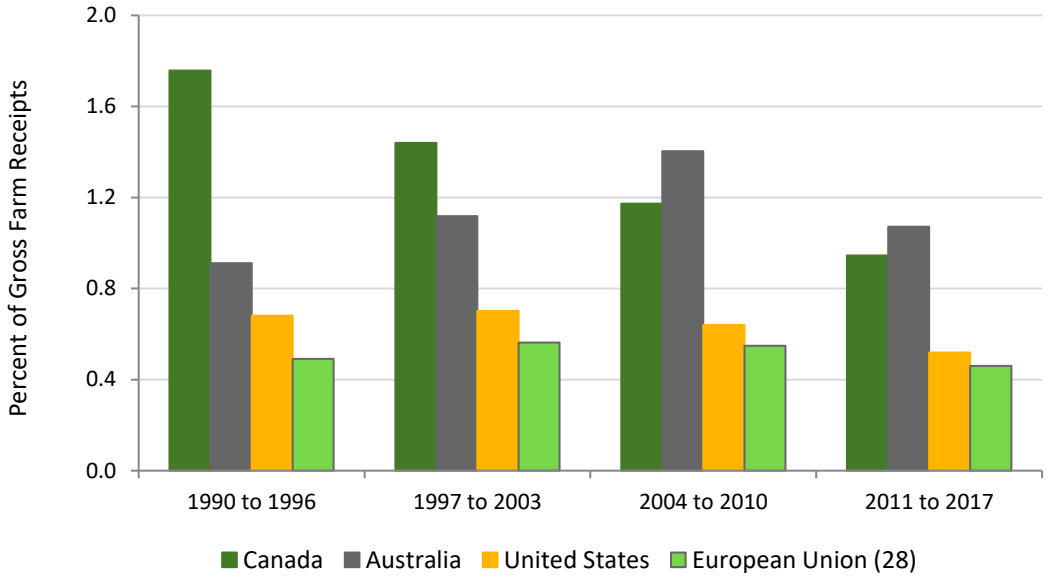
Figure 1 shows that spending on agricultural research and development as a percentage of farm receipts has been declining steadily since 1990. According to Agriculture and Agri-Food Canada estimates for 2017–2018, federal and provincial spending on research and development account for one-third and two-thirds, respectively, for a total of $754 million (Figure 2).

91 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 30 May 2018, 1615 (Serge Buy).

92 Government of Canada, 2017 Budget — Measures to Support Clean Technology.

93 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 21 March 2018, 1635 (Tom Rosser).

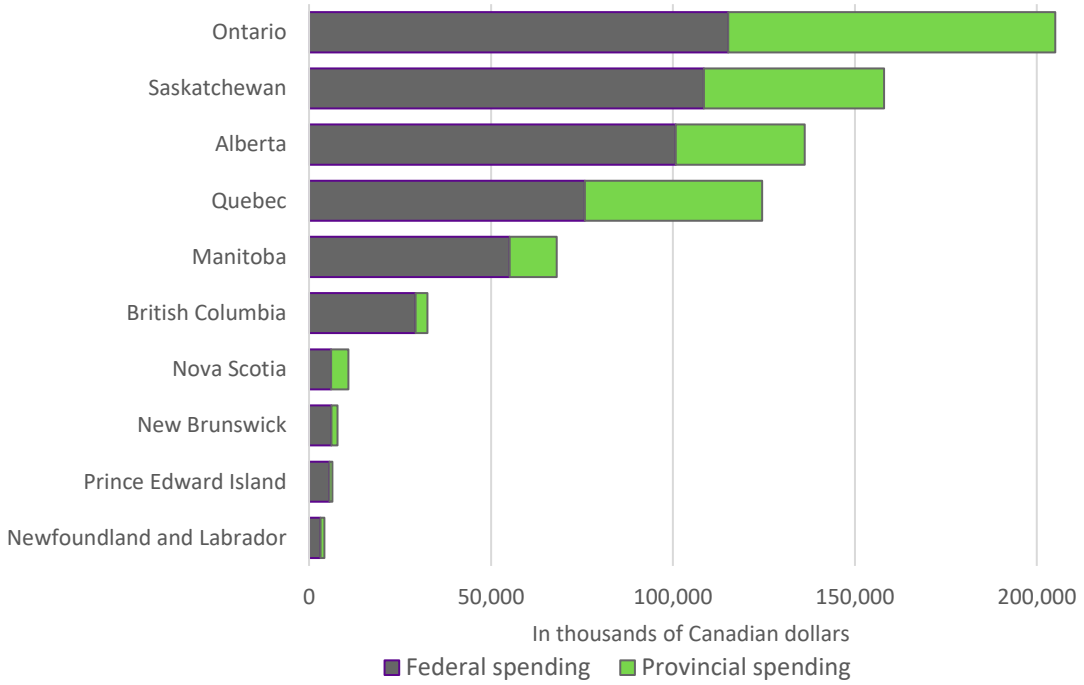
Figure 1—Public R&D Spending in Support of the Agriculture and Agri-food Sector as a Share of Gross Farm Receipts for Selected Countries, 1990 to 2017



Source: Data provided by Agriculture and Agri-food Canada.

Note: This chart uses the General Services Support Estimate sub-category H.1 Agricultural knowledge generation.

Figure 2—Federal and Provincial Public R&D Spending in Support of the Agriculture and Agri-food Sector (2017–2018)



Source: Data provided by Agriculture and Agri-food Canada.

Witnesses agreed that greater investment in research and development is needed for the agriculture and agri-food sector to expand and achieve its export goals. Tyler Hopson said that his company spends about $11 million on continuous improvement, research and development, and new technology development.[94] Similarly, Maple Leaf Foods said it had invested more than $1.5 billion in capital upgrades in the past six years.[95]

Colleges and universities emphasized the need to invest in training to support the next generation of researchers, train technology transfer officers and prepare future leaders. Officials from Colleges and Institutes Canada told the Committee that there is a very high demand for training in new technologies. For that reason, educational institutions must be able to rely on facilities and teachers to train people to use these technologies. Colleges and Institutes Canada works closely with the industry to pinpoint companies' needs.

94 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 0855 (Tyler Hopson).

95 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 June 2018, 1545 (Rory McAlpine).

> [T]he partnership with industries and companies, to have a conversation and help companies and industries understand what technology is emerging and what the future workforce is going to need and to then develop training — to either access the training that is already available or to tailor-make it so that it can be delivered to employees in the workplace—is an area of tremendous opportunity.[96]

On the subject of collaboration, witnesses support the Canadian supercluster that brings together stakeholders in the agri-food chain. Witnesses believe that agri-science clusters stimulate innovation, advance public research and are excellent channels for knowledge transfer. Witnesses welcomed federal funding for the Protein Industries Supercluster in the Prairies. This supercluster will develop many innovations and try to meet the growing demand for products rich in vegetable proteins to replace meat products.[97]

Recommendation 23—Priority on export and development

That the Government of Canada put a priority on research and development projects that can result in export development and make this part of funding decisions.

CONCLUSION

New technologies will significantly change how agricultural activities are carried out as well as the day to day lives of farmers. While they create many opportunities throughout the Canadian economy, their application in agriculture and agri-food represents a key mechanism for the sector to achieve its ambitious export growth objectives. However, getting all the players in the agriculture and agri-food value chain to adopt new technologies is a challenge that will require input from other sectors of the economy, such as science and telecommunications, and support from government for these changes to fully benefit the Canadian economy.

96 House of Commons, AGRI, *Evidence*, 42nd Parliament, 1st Session, 18 September 2018, 0925 (Christine Trauttmandsdorff).

97 Government of Canada, Protein Industries Supercluster.

APPENDIX A
LIST OF WITNESSES

The following table lists the witnesses who appeared before the Committee at its meetings related to this report. Transcripts of all public meetings related to this report are available on the Committee's webpage for this study.

Organizations and Individuals	Date	Meeting
Department of Agriculture and Agri-Food	2018/03/21	92
Brian T. Gray, Assistant Deputy Minister Science and Technology Branch		
Tom Rosser, Assistant Deputy Minister Strategic Policy Branch		
Marco Valicenti, Director General Sector Development and Analysis Directorate, Market and Industry Services Branch		
Bayer CropScience Inc.	2018/04/30	98
Paul Thiel, Vice-President Product Development & Regulatory Science		
BioFoodTech	2018/04/30	98
Jim Smith, Executive Director		
Canada Grains Council	2018/04/30	98
Krista Thomas, Director of Plant Innovation		
CropLife Canada	2018/04/30	98
Pierre Petelle, President and Chief Executive Officer		
Agricultural Institute of Canada	2018/05/30	100
Serge Buy, Chief Executive Officer		
Canola Council of Canada	2018/05/30	100
Brian Innes, Vice-President Public Affairs		
API Labs Inc.	2018/06/18	102
Ryan Mercer, Board Member		
Glen Metzler, Chief Executive Officer		

Organizations and Individuals	Date	Meeting
EIO Diagnostics	2018/06/18	102
Damir Wallener, Chief Executive Officer		
Maple Leaf Foods Inc.	2018/06/18	102
Rory McAlpine, Senior Vice-President Government and Industry Relations		
Alberta Pulse Growers Commission	2018/09/18	104
Leanne Fischbuch, Executive Director		
Colleges and Institutes Canada	2018/09/18	104
Stuart Cullum, President Olds College		
Christine Trauttmansdorff, Vice-President Government Relations and Canadian Partnerships		
Mosaic	2018/09/18	104
Tyler Hopson, Public Affairs Manager		
Niagara College	2018/09/18	104
Michael Duncan, Natural Sciences and Engineering Research Council Industrial Research Chair Colleges in Precision Agriculture & Environmental Technologies		
Sarah Lepp, Senior Research Associate Research and Innovation		
Gregor MacLean, Research Project Manager Research and Innovation		
Association of Equipment Manufacturers	2018/09/20	105
Howard Mains, Canadian Public Policy Advisor		
BIOTECanada	2018/09/20	105
Andrew Casey, President and Chief Executive Officer		
Centre d'innovation sociale en agriculture	2018/09/20	105
Simon Dugré, Director		
Richardson International Limited	2018/09/20	105
Jean-Marc Ruest, Senior Vice-President Corporate Affairs and General Counsel		
Saskatchewan Association of Rural Municipalities	2018/09/20	105
Ray Orb, President		

APPENDIX B
LIST OF BRIEFS

The following is an alphabetical list of organizations and individuals who submitted briefs to the Committee related to this report. For more information, please consult the Committee's webpage for this study.

Agricultural Institute of Canada

Association of Equipment Manufacturers

Beef Cattle Research Council

Canadian Cattlemen's Association

Canadian Federation of Agriculture

Canadian Hemp Trade Alliance

Canadian Seed Trade Association

Centre d'innovation sociale en agriculture

Farm Management Canada

Global Institute for Food Security

Monsanto Canada Inc.

Mosaic

Syngenta Canada

University of Guelph

APPENDIX C
TRAVEL FROM MAY 7, 2018 TO MAY 10, 2018

Organizations and Individuals	Date	Location
Jefo	2018/05/07	Quebec
Lassonde Industries Inc.	2018/05/07	Quebec
LB Maple Treat	2018/05/07	Quebec
Prograin Inc.	2018/05/07	Quebec
BioEnterprise	2018/05/07	Ontario
Bioproducts Development and Discovery Centre, University of Guelph	2018/05/08	Ontario
Cargill Meat Solutions Distribution	2018/05/08	Ontario
Grain Farmers of Ontario	2018/05/08	Ontario
Innovation Guelph	2018/05/08	Ontario
Ontario Agri-Food Technologies	2018/05/08	Ontario
Semex	2018/05/08	Ontario
Syngenta Canada	2018/05/08	Ontario
University of Guelph	2018/05/08	Ontario
Wilton Consulting Group	2018/05/08	Ontario
Ag West Bio Inc.	2018/05/09	Saskatchewan
Case New Holland (CNH Industries)	2018/05/09	Saskatchewan
Global Institute for Food Security	2018/05/09	Saskatchewan
GrainsConnect	2018/05/09	Saskatchewan

Organizations and Individuals	Date	Location
Innovation Place	2018/05/09	Saskatchewan
Saskatchewan Food Industry Development Inc.	2018/05/09	Saskatchewan
Dairy Education and Research Centre, University of British Columbia	2018/05/10	British Columbia
Food and Resource Economics, University of British Columbia	2018/05/10	British Columbia
Land and Food Systems Faculty Advisory Board, Research Committee, University of British Columbia	2018/05/10	British Columbia
University of British Columbia Farm	2018/05/10	British Columbia
Vancouver Fraser Port Authority	2018/05/10	British Columbia

REQUEST FOR GOVERNMENT RESPONSE

Pursuant to Standing Order 109, the Committee requests that the government table a comprehensive response to this Report.

A copy of the relevant *Minutes of Proceedings* (Meetings Nos. 92, 98, 100, 102, 104 to 106, 109, 116 to 118 and 122 to 124) is tabled.

Respectfully submitted,

Pat Finnigan
Chair

The Government of Canada must eliminate the carbon tax, which hurts Canada's international competitiveness and hinders agriculture and agri-food innovation.

House of Commons Standing Committee on Agriculture and Agri-Food: Dissenting Opinion

This dissenting opinion reflects the views of the following conservative members who sat on the Standing Committee on Agriculture and Agri-Food ("the Committee"): Luc Berthold (Committee Vice-Chair, Mégantic–L'Érable), Earl Dreeshen (Red Deer–Mountain View) and Bev Shipley (Lambton–Kent–Middlesex).

Background

On 21 March 2018, the Committee undertook the study *Advancements of Technology and Research in the Agriculture and Agri-Food Sector That Can Support Canadian Exports*. The Committee divided the study into three parts: international trade; technological advancements in the sector; and the role of government and the regulatory framework. During six meetings, the Committee heard from 25 witnesses who highlighted a number of current and emerging trends driving progress in the sector, as well as various challenges that we must address if we are to expand our agriculture and agri-food exports.

Reasons for a dissenting opinion

The Committee studied the advancements of technology and research in the agriculture and agri-food sector that can support exports. According to the Conservative members of the Official Opposition, the report tabled by the government does not accurately represent the statements of all the witnesses who appeared. Witnesses who spoke about the carbon tax said that this additional tax was going to disadvantage Canada both abroad and at home. This dissenting opinion aims to clarify the issue and make an additional recommendation to the Government of Canada to ensure that Canadian exporters can increase trade without being hampered by a new tax, as well as avoid increasing the tax burden on the agriculture and agri-food sector.

The Committee report does not consider the impact of a carbon tax on Canada's agriculture and agri-food sector

In 2018, the Government of Canada decided to proceed with the *Pan-Canadian Framework on Clean Growth and Climate Change,* a plan that charges Canadians a new tax: the carbon tax.

Since then, this carbon tax has been widely condemned, and several provinces have rejected it because of its negative impact on Canada's economy

Canada's Agri-Food Economic Strategy Table recommends that Canada expand its foreign trade by aiming to increase agri-food exports to $85 billion per year by 2025. The goal is to position Canada as the world's second largest exporter and fifth in terms of agri-food products.

Witnesses told the Committee that the carbon tax will be detrimental to Canada's trade. Introducing such a tax could even compromise growth targets. The Committee report makes no mention of what the agriculture and agri-food sector is actually experiencing. At a Committee meeting, one witness said that "[c]arbon taxes in a global environment put Canadian exports in an uncompetitive position against others who can supply product at a lower cost due to less regulation. A regulatory impact analysis on the agriculture sector needs to be investigated prior to adopting further legislation."[1]

This additional tax will affect not only international trade, but also Canadian investment and economic growth. Another witness whose comments were ignored in the Committee report described the situation: "Right now, there are several major initiatives under way, including carbon pricing, the impact assessment review and regulations, and the clean fuel standards. These must not be viewed in silos, as the cumulative impacts of federal regulations could discourage global companies from continuing to make investments in innovation for the betterment of both the environment and the economy. In fact, some recent studies show that the rate of investment in Canada has already slowed considerably in the last several years."[2]

The carbon tax will harm Canada's competitiveness in the agriculture and agri-food sector, since our products will bear an additional tax not charged by other countries. As well, this tax will not encourage farmers to invest more in technological advances. We must enable companies to invest in research and development to ensure that their farmland is sustainable.

Several witnesses said that the technological advances being introduced by their companies are environmentally responsible. Farmers look after their land and care about the environment because it is their livelihood. One witness even said that he already had a plan to reduce his company's environmental footprint: "[W]e have made efforts over the last number of years and even decades to improve our environmental performance. As a company, we have set some internal targets—and that's global, as well as across Canada—to reduce our emissions by 10% per product tonne by the year

[1] House of Commons, AGRI, Evidence, 42nd Parliament, 1st Session, 18 September 2018, 1000 (Leanne Fischbuch, Executive Director, Alberta Pulse Growers Commission).

[2] House of Commons, AGRI, Evidence, 42nd Parliament, 1st Session, 18 September 2018, 0900 (Tyler Hopson, Public Affairs Manager, Mosaic).

2020. As far as greenhouse gas emissions go, we've already achieved a 5% reduction, with more to come, as well as reductions in energy and freshwater use."[3]

The Committee's report as presented does not reflect what witnesses said about the negative impact that a carbon tax will have on the agriculture and agri-food industry.

Conclusion

We urge the government to consider everything the Committee heard as part of the study *Advancements of Technology and Research in the Agriculture and Agri-Food Sector That Can Support Canadian Exports.* This dissenting opinion presents the critical issue of the carbon tax that the government must address in order for Canada to remain competitive on the agriculture and agri-food market.

Although Canadian agriculture still relies on current energy sources such as fossil fuels, farmers are the custodians of the land, and no industry contributes more to eliminating carbon than farming. We want to improve the quality of life for farmers and further the technological advancements of agriculture and agri-food businesses, and the carbon tax is not the solution.

Recommendation

That the Government of Canada eliminate the carbon tax, which hurts Canada's international competitiveness and hinders agriculture and agri-food innovation.

Respectfully submitted by

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[3] Ibid.