



Innovation in Agriculture:

THE KEY TO FEEDING A GROWING POPULATION

Report of the Standing Senate Committee
on Agriculture and Forestry

The Honourable Percy Mockler, Chair

The Honourable Terry M. Mercer, Deputy Chair

June 2014

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Ce rapport est également offert en français.

[F]armers are constantly being challenged to find new solutions to new problems. The challenges faced by the farmer in the future will likely be very different from the problems faced today. Farmers are very good at what they do. They adapt to new markets, innovate new techniques and are constantly looking for ways to increase productivity. (Mr. Art Enns, Owner/Operator, Art Enns & Sons Ltd., 9 May 2013)



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MEMBERS



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The Honourable Terry M. Mercer,
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The Honourable Senators:



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Claudette Tardif

Ex-officio members of the Committee:

The Honourable Senators Claude Carignan, P.C., (or Yonah Martin) and James S. Cowan (or Joan Fraser).



The committee would like to recognize the following Honorable Senators who are no longer serving members of the committee whose contribution to the study was invaluable.



JoAnne L. Buth



Catherine S.
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Donald Neil Plett



Michel Rivard

Other Senators who have participated from time to time in this study:

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Nicole Raymond, Administrative Assistant



ORDER OF REFERENCE

Extract from the *Journals of the Senate*, Thursday, November 7, 2013:

With leave of the Senate,

The Honourable Senator Mockler moved, seconded by the Honourable Senator Greene:

That the Standing Senate Committee on Agriculture and Forestry be authorized to examine and report on research and innovation efforts in the agricultural sector. In particular, the Committee shall be authorized to examine research and development efforts in the context of:

- (a) developing new markets domestically and internationally;
- (b) enhancing agricultural sustainability;
- (c) improving food diversity and security; and

That the papers and evidence received and taken and work accomplished by the committee on this subject during the First session of the Forty-first Parliament be referred to the Committee; and

That the Committee submit its final report to the Senate no later than June 30, 2014 and that the Committee retain until September 30, 2014 all powers necessary to publicize its findings.

The question being put on the motion, it was adopted.

Gary W. O'Brien

Clerk of the Senate



FOREWORD

The Canadian agriculture and agri-food sector plays an important role in the Canadian economy. In 2012, one in eight jobs (representing over 2.1 million people) was from this sector which contributed to 6.7% of total Gross Domestic Product. At the international level, Canadian agriculture and agri-food exports generated \$43.6 billion in 2012; which represented 3.5% of the world agriculture and agri-food exports.

Canadian farmers are a hardworking and innovative group. They are able to produce 2.5 times what Canadians consume but more is needed. The United Nations predicts that by 2050, nine billion people will need to be fed and Canada has an important role in assuring this occurs.

Considering these remarkable figures, the Standing Senate Committee on Agriculture and Forestry felt it important to undertake a study on research and innovation efforts in the agriculture and agri-food sector in Canada. We are proud to now table our report entitled *Innovation in Agriculture: The Key to Feeding a Growing Population*.

The first part of the report focuses on how the sector is constantly changing and how those involved must be ready to adapt. The second part of the report speaks to the importance of innovation and its necessity in achieving desired goals. The final part of the report emphasizes the need to continue to be innovative and open to new ideas.

During the course of this study, the committee had the privilege to meet many of those involved in the Canadian agriculture and agri-food sector. We would like to thank all who contributed to this study and recognize their status as highly trained and educated professionals in this essential Canadian sector.

We would also like to thank all of our colleagues who have participated in this study as well as the administrative staff from both the Senate and Library of Parliament who have helped in the preparation of this report.

Percy Mockler, Chair

Terry M. Mercer, Deputy Chair



EXECUTIVE SUMMARY

The Standing Senate Committee on Agriculture and Forestry undertook a study on research and innovation efforts in the Canadian agriculture and agri-food sector. During its study, the Committee went on fact-finding missions in Canada and the United States. These missions enabled them to visit Agriculture and Agri-Food Canada research centres, academic and private research facilities, processing plants, biofuel manufacturing plants, farmers and agricultural organizations. During its hearings in Ottawa, the Committee heard from 170 witnesses over 14 months. Stakeholders from the entire supply chain, from input to the retail market, representatives from government and federal and provincial agencies, scientists, academics, and civil society representatives appeared before the Committee. The purpose was to hear witnesses' perspectives on the challenges facing the Canadian agriculture and agri-food sector and how research and innovation can help stakeholders overcome these challenges while adapting to the changing agricultural landscape.

The final report consists of three parts. The first part describes the factors shaping the Canadian agriculture and agri-food sector. The global population is expected to increase by 2.3 billion by 2050. This increased demand will create pressure on the use of natural resources. The increase in production needed to meet growing demand must be done sustainably to protect the environment. Even though greenhouse gas emissions from agriculture have decreased since 2008, Environment Canada data show that the sector was nevertheless still responsible for 10% of emissions in 2011. Sustainable agricultural practices are therefore needed to reduce the impacts of climate change. The increase in production will also create pressure on inputs, including human resources. The Canadian farming population is aging and may not be replaced because of high entry costs, problems related to farm transfers, and lack of interest from young people in this sector.

This increase in production requires a competitive and modern agriculture sector based upon so-called family farms, or farms supplying niche markets, and larger farmers that benefit from economies of scale. The ability to offer agri-food products at lower prices is necessary for farmers to be able to face international competition from regions or countries such as the European Union, the United States, China, and Brazil. Emphasis must also be placed on quality and product differentiation in order to stand out in the mass market. Taking consumers' needs into account regarding traceability, food safety, nutritional value, and product diversity could also provide a competitive edge. However, other variables such as the exchange rate or grain prices can affect the competitiveness of some agricultural and agri-food products, which has created an interest in using innovative products or methods to overcome these challenges.

This interest in innovation is explored in the second part of the report. The federal government plays an important role in creating an environment that encourages research and innovation in Canada. Through the development of a science-based legislative and regulatory framework, the federal government is able to guide the introduction of new products on the market or the development of new methods. It participates in and funds research and innovation activities undertaken within government itself or in partnership with industry and academia. Several federal departments are also involved in regulating, funding, and research. Agriculture and Agri-Food Canada plays a leading role in agricultural and agri-food research as well as in funding industry-led research, development, marketing, and traceability



projects. The Canadian Food Inspection Agency plays a key role in food inspection, animal health, plant protection and consumer protection. The Agency is responsible for enforcing the standards and policies established by Health Canada. Within Health Canada, the Pest Management Regulatory Agency is responsible for regulating pesticides. Environment Canada, together with Health Canada, evaluates potential risks to the environment, human health or the environment on which life depends. Federal agencies such as the National Research Council of Canada, the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada and the Social Sciences and Humanities Research Council also play an important role in financing research projects. Through this legislative and regulatory framework, several innovations have been made in the areas of sustainable development, the improvement of agricultural productivity and competitiveness, maintaining and developing markets, health and the nutritional value of foods, and product traceability.

However, further efforts must be made for the Canadian agriculture and agri-food sector to fully benefit from research and innovation. The third part of the report outlines the areas in which it is important to strengthen and improve the regulatory framework, government support measures, collaboration and partnerships, international agreements, training for farmers and public awareness.

The government must play a facilitating role in ensuring an environment that enables research, development and innovation in the market. It is important that the government continue its efforts in basic research and invest, by adopting a long-term vision, in priority research areas considered as public good. As to improving and strengthening the regulatory framework, efforts must be made to strengthen the approval process for new products, modernize the regulations on animal health and disease control and surveillance, strengthen intellectual property protection and review the regulatory framework for nanotechnology. The government must also continue its efforts to harmonize the regulatory framework at the international level so that Canadian stakeholders have access to the same products as their foreign competitors. Research and innovation funding needs to be improved both in the public and private sectors. Public funding must be directed toward appropriate support measures that reflect the diversity of the production structure. The administrative process facilitating access to public funding should be accelerated and flexible to encourage the commercialization of new products on the market. Public funding must also improve the quality of the agricultural research structure and facilitate the sharing of data and knowledge among researchers. In terms of private funding, producer contributions seem to be a relatively important source of funding that encourages innovation, especially when producers can benefit from the positive impact of research and innovation. This source of funding could be supplemented by access to venture capital or the enforcement of intellectual property rights.

Efforts must be pursued in terms of vertical and interdisciplinary partnerships and collaboration to encourage exchanges among the various Canadian agriculture and agri-food stakeholders. On the commercial side, the elimination of non-tariff barriers, at the national and international levels, is necessary to facilitate the exchange of products derived from new technologies.

Lastly, the adoption of new methods or technologies on the market requires professional development for producers in terms of business management and risk management. It is also important to enhance the value of agricultural workers and to raise public awareness about the realities of the agriculture and agri-food sector to dispel the negative perceptions the public may have regarding the consumption of products derived from new methods or technologies.



LIST OF RECOMMENDATIONS

Recommendation 1 (page 35)

The Committee recommends that Agriculture and Agri-Food Canada, the Canadian Food Inspection Agency, and the Canadian Grain Commission complete the regulatory amendments of the *Seeds Act* to modernize the variety registration process.

Recommendation 2 (page 36)

The Committee recommends that Health Canada and the Canadian Food Inspection Agency make changes to the Safety Assessment Process for Plants with Novel Traits to centralize information and data collection, accelerate the review process, and improve predictable timeframes.

Recommendation 3 (page 37)

The Committee recommends that Health Canada and the Canadian Food Inspection Agency strengthen the safe, predictable, and transparent system for commercialization of plants with novel traits for molecular farming.

Recommendation 4 (page 38)

The Committee recommends that:

- Health Canada, through all relevant stakeholders, including the provinces and territories, continue its ongoing research activities related to the efficacy of pesticides and their safety for humans, animals, and on the environment; and
- Health Canada take the necessary action to reduce the number of conditional registrations of pest control products.

Recommendation 5 (page 39)

The Committee recommends that Health Canada, while maintaining Canada's high food safety standards, develop innovative procedures that reduce the time for the evaluation of technical and scientific data during the safety assessment of food additives, novel foods (including biotechnology-derived foods and foods bearing health claims, such as functional foods) and infant formula prior to their commercialization.

Recommendation 6 (page 40)

The Committee recommends that:

- the Canadian Food Inspection Agency continue to address disease control and prevention in its modernization of animal health regulations; and



- the Canadian Food Inspection Agency, together with the provinces, territories, and stakeholders, work on implementing a new national disease surveillance plan.

Recommendation 7 (page 41)

The Committee recommends that the Canadian Intellectual Property Office review the patent application process as well as evaluate the impact of renewing or extending the length of patent protection on the Canadian market.

Recommendation 8 (page 42)

The Committee recommends that Agriculture and Agri-Food Canada and the Canadian Food Inspection Agency bring the *Plant Breeders' Rights Act (1990)* up to the standards of the 1991 Act of the International Convention for the Protection of New Varieties of Plants.

Recommendation 9 (page 44)

The Committee recommends that Health Canada and Environment Canada strengthen regulations on nanomaterials to reflect the recommendations made by the Council of Canadian Academies in its 2008 report. The Committee recommends that changes to the regulations be made as soon as possible.

Recommendation 10 (page 45)

The Committee recommends that the Government of Canada harmonize its regulations with those of its trading partners in key areas in the agriculture and agri-food sector without compromising health or the environment and that this become part of any new trade agreements.

Recommendation 11 (page 49)

The Committee recommends that

- Agriculture and Agri-Food Canada, set common strategic priorities for science and innovation that will be part of a long-term vision and integrated with sector objectives for profitability, sustainability, and competitiveness; and
- Agriculture and Agri-Food Canada ensure stakeholders are fully aware of the funding from all sources that are allocated to common strategic priorities.

Recommendation 12 (page 51)

The Committee recommends that Agriculture and Agri-Food Canada, in cooperation with the provincial and territorial governments, continue and augment the funding of the AgriInnovation Program and renew the Canadian Agricultural Adaptation Program or develop a similar program so that farmers can continue to resolve issues specific to their region.



Recommendation 13 (page 52)

The Committee recommends that

- the Government of Canada encourage the use of second- and third-generation biofuels in conventional fuel; and
- the Government of Canada establish funding programs to support research into and the commercialization of second- and third-generation biofuels.

Recommendation 14 (page 52)

The Committee recommends that the Government of Canada enhance the Scientific Research and Experimental Development Program to reflect the needs of the agriculture and agri-food sector and related sectors.

Recommendation 15 (page 54)

The Committee recommends that

- the Government of Canada facilitate researchers' access to suitable agricultural research facilities and equipment by means of existing funding and infrastructure programs;
- the Government of Canada earmark funds to develop long-term data-sharing tools when providing financial support to research projects; and
- the Government of Canada reinstate agri-food as a priority research area for the Natural Sciences and Engineering Research Council of Canada and the National Research Council Canada.

Recommendation 16 (page 56)

The Committee recommends that the Government of Canada set policies which enhance the access of small and medium-sized enterprises (SMEs) to venture capital in order to better meet the needs of SMEs in the agriculture and agri-food sector.

Recommendation 17 (page 58)

The Committee recommends that Agriculture and Agri-Food Canada strengthen vertical and interdisciplinary collaboration by fostering communication with consumers, academia, and federal departments and agencies interested in agricultural and agri-food issues.

Recommendation 18 (page 60)

The Committee recommends that the Government of Canada continue its work on the Codex Alimentarius Commission in order to better harmonize pesticide maximum residue limits and thereby promote the elimination of sanitary and phytosanitary barriers.



Recommendation 19 (page 60)

The Committee recommends that Agriculture and Agri-food Canada improve the strategic market information available to sector stakeholders in order to effectively meet their needs.



INTRODUCTION

Throughout all of history, the agricultural sector has responded to new challenges through improved knowledge, production methods, and tools. Ten thousand years ago, humans gave up their nomadic way of life and shifted from hunting and gathering to farming and raising livestock. They farmed based on the process of natural selection and adapted their practices to changes in climate and geography. The Industrial Revolution of the 19th century also brought major structural changes which resulted in rural-urban migration and moved society from a mainly agrarian base to a commercial and industrial one. The rural exodus also meant that there were fewer farmers producing food for the growing urban population. Thanks to the green revolution, which was characterized by scientific progress in phyto-genetics, adapted farm management techniques, and the use of natural resources, farmers were able to meet society's needs by increasing agricultural yields.

In recent years, the agricultural sector has faced major changes yet again. Over the past few years, the public has become increasingly concerned about the use of our natural resources and the possible damaging impact of human activities on the environment. Society is also seeking to ensure the well-being of current and future generations. Consequently, people expect the agriculture and agri-food sector to feed the population with healthy and nutritious food available at reasonable prices while responding to demographic, environmental, and economic issues. Once again, farmers are being called on to adapt to changes and meet society's needs with little recognition. The success of the agriculture industry is related to its acceptance of innovation and its ability to adapt to changing pressures. Now, with increasing pressure to produce more with less in a sustainable manner, the importance of innovation is even greater. This is why the Senate Standing Committee on Agriculture and Forestry chose to study this important topic.

Part 1 of the report describes the factors shaping the Canadian agriculture and agri-food sector. The sector needs to respond to such pressures as global population growth, an aging farming population, access to limited natural resources, climate change, economic issues, and societal change.

Part 2 explores how innovation is a driving force for the development of the agriculture and agri-food sector. To this end, the report discusses the scope on innovation. The federal government's responsibilities regarding innovation and research and development are described. The section also provides examples of technological breakthroughs with respect to sustainable development, the improvement of productivity and competitiveness, maintaining and expanding markets, as well as food quality and safety.

Part 3 of the report demonstrates the need for continued efforts to ensure that the agriculture and agri-food sector can greatly benefit from science and innovation. Efforts must focus on strengthening and enhancing the regulatory framework, government support measures, collaborations and partnerships, the importance of science in international agreements, training for farmers, and public awareness and appreciation of agricultural issues.

PART 1

THE CHANGING LANDSCAPE OF THE CANADIAN AGRICULTURE AND AGRI-FOOD SECTOR



PART 1: THE CHANGING LANDSCAPE OF THE CANADIAN AGRICULTURE AND AGRI-FOOD SECTOR

A. Demographic Challenges

1. Balance between Supply and Demand

Governments and stakeholders are aware of the demographic challenges facing the agriculture sector. In 2009, the Food and Agriculture Organization (FAO) of the United Nations reported that the world's population would likely increase by 2.3 billion to reach approximately 9 billion by 2050. Nearly all of the population growth is expected to take place in the developing countries of Sub-Saharan Africa and Asia.¹ The FAO anticipates an increase in global food consumption given that 70% of the world's population will live in cities or urban areas by that time, and the income of people living in developing countries will continue to increase. Officials from Agriculture and Agri-Food Canada and Export Development Canada, as well as representatives from the Agricultural Institute of Canada and the Canadian Seed Trade Association, stated that **agricultural production needs to increase by 50% to 70% by 2050** to meet the increased food requirements of a larger global population.

However, increasing worldwide agricultural production is partially constrained by access to limited natural resources such as water and arable land.

[T]o feed a growing population, agricultural productivity will need to increase by 1.5 per cent annually. However, agricultural productivity is affected by natural resource constraints, such as the decline in per capita arable land, primarily due to population growth and urbanization, and the competition for water use. (Ms. Jennifer MacTavish, Executive Director, Canadian Sheep Federation, 1 November 2011)

In addition, FAO data show that the amount of agricultural land has declined. Using agricultural land per capita as an indicator, which shows the influence of demographic growth on the availability of agricultural land, this resource decreased by nearly 33% between 1980 and 2011.

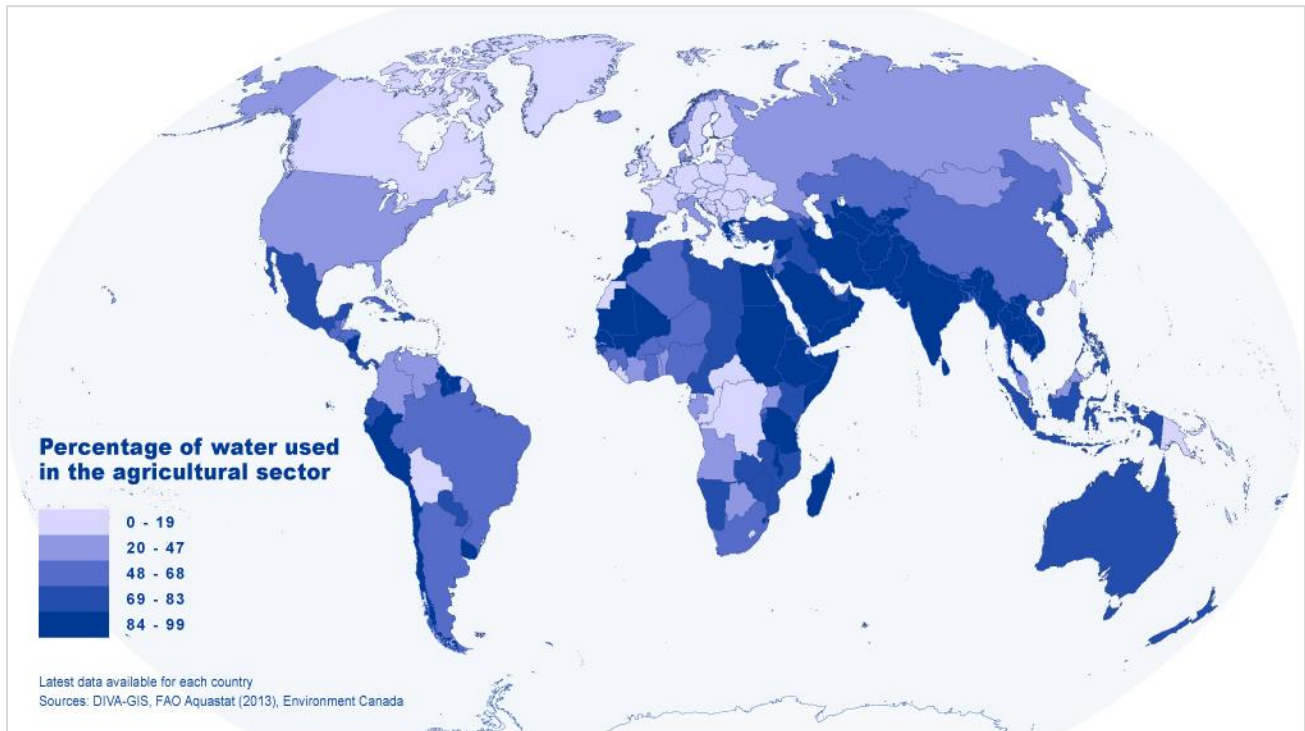
With respect to water use, FAO data (see Figure 1) shows that the percentage of water used solely for agricultural purposes is greater than 50% and even exceeds 90% in many countries. These figures take into account water used for anthropogenic and industrial purposes.

An increase in agricultural production may therefore reduce the amount of water required for other economic and human activities.

¹ Food and Agriculture Organization of the United Nations, [2050: A third more mouths to feed](#), 23 September 2009, Rome.



Figure 1: Percentage of Water Used in the Agricultural Sector



Unlike countries such as China and India, Canada may be able to increase its agricultural production without jeopardizing its natural resources, owing to its extensive cropland and water resources.

Canada is one of the very few places on earth with sufficient arable land and water resources to be able to increase agricultural production. (Mr. John M. Weekes, as an individual, 13 March 2012)

Many witnesses are therefore aware of the fact that Canada contributes and will keep contributing to food production for global consumption.

I believe Canada has and will be playing a lead role in feeding the world. (Mr. Mike Nowosad, Chief Executive Officer, Canadian 4-H Council, 15 May 2012)

Certainly, I believe Canada has and will be playing a lead role in feeding the world... (Mr. Garnet Etsell, Co-Chair, National Food Strategy, Canadian Federation of Agriculture, 24 April 2012)

However, as stated by Mr. Hammermeister, Director of the Organic Agriculture Centre of Canada, it is important to consider the potentially harmful impact of intensive agricultural activities on water and soil quality. While conventional agricultural practices played a key role in improving agricultural productivity and profitability during the green revolution, these same practices have in some areas, over time, contributed to soil degradation and the eutrophication of water resources. Despite the abundance of



Canada's natural resources, producers must continue to adopt sustainable agricultural practices in order to preserve the quality of our water and soil.

It is also using the resources very carefully. We cannot continue to keep over-fertilizing and seeing stuff wasted. Those days will come to an end.... It is also using the water wisely. (Mr. Richard Phillips, Executive Director, Grain Growers of Canada, 25 October 2011)

In addition to limited natural resources, Canada's agricultural sector is experiencing a decline in the growth rate in productivity that is also hampering its productive capacity.

We note across Canada, the U.S. and Australia a slight decline in the annual growth rate in agricultural total factor productivity. I think most observers would expect that decline to continue over the next decade. (Mr. Ken Ash, Director, Trade and Agriculture Directorate, Organisation for Economic Co-operation and Development (OECD), 28 February 2013)

This is an area where innovation will be very important to improving productivity.

Waste is another factor limiting the amount of agricultural and agri-food products available, and it occurs throughout the supply chain. Witnesses emphasized that storage and transportation activities must be improved in order to curb waste.

... just about every place you look nowadays you will see that we are producing probably enough food for 9 billion people, yet we are told repeatedly that we are wasting about half of it. I am trying to suggest that, yes, okay let us increase food production for this growing world population, but let us also make better use of what we are producing right now. (Dr. Reuben Mapletoft, Distinguished Professor, Department of Large Animal Clinical Sciences, University of Saskatchewan, 5 February 2013)

2. An Aging Farm Population and the Next Generation of Farmers

Witnesses also mentioned that Canada's aging farm population is yet another factor affecting the agricultural landscape. This factor results in changes in farm management practices and the ability of the sector to attract new farmers.

As you know, the average age of Canadian farmers is increasing, making it more important than ever to bring new entrants into farming. (Ms. Lynne Markell, Government Affairs and Public Policy Advisor, Canadian Co-operative Association, 28 February 2012)

In Canada, the average age of farmers is rising steadily. According to Statistics Canada data in Table 1, the average age has climbed from 48 to 54 in 15 years.



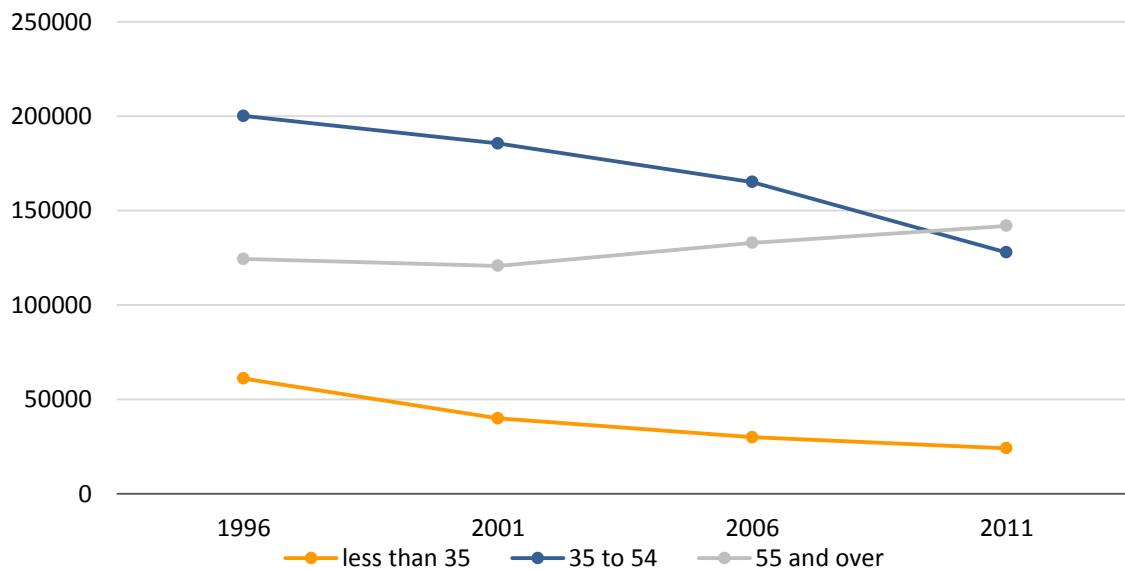
Table 1: Average Age of Farm Operators

2011	2006	2001	1996
54.0	52.0	49.9	48.4

Source: Statistics Canada, Farm and farm operator data, Average age of farm operators, 2006 and 2011 Census of Agriculture.

Over the past 10 years, the aging of the farm population has resulted in an 18% increase in the number of farm operators aged 55 and older, a 31% decrease in the number of operators aged 35 to 54, and a 40% decrease in operators under age 35. As a result, there are fewer and fewer farmers to replace those who are retiring. The aging of Canada’s farm population may have a negative impact on the long-term viability of farming operations.

Figure 2: Change in the Number of Farm Operators in Canada by Age Group



Source: Statistics Canada, Farm and farm operator data, Average age of farm operators, 2006 and 2011 Census of Agriculture.

However, the aging farm population does not affect all types of agricultural production to the same degree. According to David Wiens, Vice-President of the Dairy Farmers of Canada, in 2006, dairy farmers were younger than the average Canadian farm operator.

Statistics will bear out that dairy farmers are generally younger than the average Canadian farmer. A 2006 census on agriculture indicated that an average dairy farmer’s age is 47 years, and for the general farm sector, the average farmer age is 52 years. (Mr. David Wiens, Vice-President of the Dairy Farmers of Canada, 18 October 2011)



Most of the witnesses who spoke on this issue recognized that it is hard to attract new farmers to replace retirees. One of the barriers to entry that new farmers face is access to capital.

For most of the young farmers coming out of college or just wanting to start a farm, the equity column on the balance sheet is not great when you look at a farm that is now worth \$1 million, \$2 million, \$5 million or \$10 million. The young farmer does not have the equity to make that work (...). That is a key issue when you look at young farmers, either from a family farm or trying to get into farming from scratch. It is a huge barrier. (Mr. Justin Beck, Past Chair, Canadian Young Farmers' Forum, 28 February 2012)

Family farm transfer is another obstacle to new farmers. The lack of financial resources, communication, planning, and tools was often cited by the stakeholders as the reason why the transfer of intergenerational farms is difficult to achieve.

Agriculture does not hold much interest for young people, and this explains why it is hard to attract them to the sector. According to Sue Walker, Director of Development and Provincial Relations at the Canadian 4-H Council, young people no longer stay on the family farm, preferring to move to the city instead. Johanne Ross, Executive Director of Agriculture in the Classroom, stated that fewer and fewer young people are interested in agriculture because old stereotypes persist; they think that agricultural activities are limited to farming. In addition, young people who did not grow up on a farm do not think they can become farmers. With regard to agriculture and education, Ms. Ross also pointed out that it is not a priority sector for guidance counselors across the country, and agriculture is not usually part of the Canadian curriculum, unlike other countries such as the United States. Young people are interested in careers in other fields that they think will pay more, like finance. As a result, there is a decrease in the number of students pursuing professional training or mentoring.

[W]hat we are seeing in the universities is a decline in the number of students registering to become agrifood professionals. This situation is a major concern because far fewer people are interested in studying in the processing and management sector. (Mr. Frédéric Marcoux, President, Fédération de la relève agricole du Québec, 28 February 2012)

Lianne Dwyer, Vice President at the Agricultural Institute of Canada, explained that young people were often not interested in a career in agriculture because of the sector's low profitability.

B. Climate Change

Committee members noted that, generally speaking, climate change is a new factor affecting the agricultural sector. While some stakeholders expressed doubts about the existence of climate change, most of the witnesses who spoke on this issue believe that the effects of climate change are tangible and have an impact on agricultural productivity and practices.

Gilles Saindon, Director General of the Science Centres Directorate at Agriculture and Agri-Food Canada, stated that the environmental effects of climate change include extreme weather events such as torrential rains and long droughts. The scientific community is concerned about these kinds of events.



According to Anne-Marie Granger Godbout, Executive Director of the Federation of Quebec Maple Syrup Producers, studies on climate change suggest that the effective sap collecting season is becoming shorter in many U.S. states.

Other witnesses made the connection between climate change and the emergence of new diseases in Canada as temperatures gradually rise.

Higher temperatures result in shifts in pest pressure. For example, we see soybean rust coming into Canada through the United States that started in South America. As temperatures rise, we will face some of these threats. (Ms. Lianne Dwyer, Vice President, Agricultural Institute of Canada, 6 March 2012)

Although most witnesses stated that climate change may have negative impacts on Canadian agriculture, others witnesses like Dr. Janice Bailey, Professor at Laval University, and Lianne Dwyer, Vice-President, Agricultural Institute of Canada, believe that the sector could also benefit from the higher temperatures accompanying climate change. For example, the growing season for crops and other horticultural products might be longer. However, Ms. Dwyer highlighted that higher temperatures may also result in heat stress for crops such as canola. While the extent of climate change is still not fully understood, its effects are already being seen. It is important that research examine the practices that will help producers adopt agricultural practices to adapt to these new climate conditions.

[T]he changes that will come about, as yet unclear changes associated with climatic patterns, will require a response for both crop and animal production. It will require that we do things both to mitigate the output of greenhouse gases and to adapt to the changing production conditions that we find ourselves in. (Mr. Ken Ash, Director, Trade and Agriculture Directorate, Organisation for Economic Co-operation and Development (OECD), 28 February 2013)

There is also a need to reduce greenhouse gas (GHG) emissions produced by agricultural and agri-food operations. According to Environment Canada, GHG emissions from the Canadian agricultural sector have declined since 2008; the agricultural sector was responsible for 10% of GHG emissions in 2011.

C. Economic Challenges

1. Farm Size

The definition of a family farm and its size varied depending on the witness. For some, a family farm is by nature small while for others, a family farm can be a large corporation, provided that it is controlled and operated by a farming family.

In Canada, as in the United States, the decrease in the number of farms has meant an increase in their size and efficiency through economies of scale. For some farmers, increased concentration is beneficial and demonstrates a responsiveness to market signals.



Many of our apple farmers and packers are relatively small operations. This makes it difficult to coordinate and implement new technology. Consolidation has happened amongst many of our competitors, resulting in operations that are able to be innovative and to adapt quickly to new market realities.
(Mr. Brian Gilroy, Chair, Ontario Apple Growers, 5 February 2013)

According to other stakeholders, concentration in the agricultural sector and the search for economies of scale lead to higher prices for farmland and a significant investment in buildings and equipment. Farmers are incurring more and more debt. **This overcapitalization discourages the entry of new farmers in the sector.** It is therefore essential for the sector to be composed of farms of varying sizes.

2. Grain Prices

Grain prices have risen over the last seven years resulting in increased returns for grain producers. However, corresponding increases in feed costs for livestock producers have also occurred. Several witnesses said that ethanol production and government support for this sector were among the main reasons explaining higher grain prices.

Traditionally, livestock, cattle and pork are one the biggest buyers of grain. One of the growing buyers of grain is the ethanol industry. We compete on an open market for what we sell. This new competitor in the market has a mandate for the use of what it sells, tariff protection against its competitors and subsidies for production and construction of their plants. All we would like to see is open competition. That way, if ethanol is the best use of feed grain, and if it is the most productive thing for our economy, then that is where it will go. (Mr. Ryder Lee, Manager of Federal Provincial Relations, Canadian Cattlemen's Association, 20 October 2011)

Witnesses commented on ethanol and greenhouse gas emissions (GHGs). Len Coad, Director of Energy, Environment and Technology Policy with the Conference Board of Canada, told the Committee that the use of ethanol-fuel blends (with an ethanol content between 10% and 85%) could reduce GHG emissions by 40% to 60%. It is not clear whether these figures take into consideration GHG emissions resulting from biomass conversion into ethanol or ethanol combustion.

However, the Committee also heard that government intervention, in the form of production mandates, import tariffs and tax measures, gives ethanol producers a competitive advantage. This advantage prevents livestock producers from competing freely with ethanol producers for grain.

Although ethanol production contributes to the increase in grain prices, some witnesses also maintained that other factors such as the weather, oil prices, and increased demand for meat products have played a key role in this increase.

3. Exchange Rate

The message I want to convey here is that Canadian agriculture has always benefited from a low Canadian dollar, and that is how we maintained our competitiveness.



Over the last few years, we have not had that and farmers are eating their profits just to stay in business. (Mr. Jacques Laforge, as an individual, 18 October 2011)

As highlighted by some witnesses, the rise in the Canadian dollar relative to the U.S. dollar, since 2002, has been detrimental to the profitability and competitiveness of commodity sectors that rely on exports, such as beef and pork. Stakeholders from the agriculture and agri-food sector have even had to stop exporting certain agricultural commodities like straw and forage because their prices are no longer competitive. The increase in the Canadian dollar relative to the U.S. dollar helped to increase the price of agricultural and agri-food exports to the U.S. while lowering the price of imports from the U.S. This double effect has made Canadian products less competitive domestically and internationally and has lowered producers' income. The exchange rate appreciation also has a negative impact on the production structure, entailing a decline of the number of producers in operation.

In addition, the appreciation of the Canadian dollar has also negatively impacted the competitiveness and profitability of other stakeholders in the supply chain, such as food processors who buy agricultural raw materials. The processing sector has become more concentrated.

(...) 50 or 54 food plants in Ontario have gone in the last six years. That is the consequence, because what we are seeing is the conditions of production and cost in Canada relative to the United States in a par dollar environment, if we are not absolutely on par. (Mr. Rory McAlpine, Vice-President, Government and Industry Relations, Maple Leaf Foods, 25 April 2013)

According to Bruno Larue, Canada Research Chair in International Agri-Food Trade and Associate Professor at Laval University, the wage structure of some processing plants has been negatively affected by a substantial decrease of 30% to 40% in order to compensate for lost profitability resulting from the strong Canadian dollar. Mr. McAlpine also explained that the restructuring of the processing industry across North America has led to an increase in U.S. slaughter capacity.

However, some witnesses stated that the rise in value of the Canadian dollar has also had positive effects and forced producers to diversify their export markets. The pork industry, for example, exports to more than 143 countries.

4. International Competition

Given that the Canadian market is relatively small and the country's productive capacity is relatively large, the international market plays an important role in the sector's profitability.

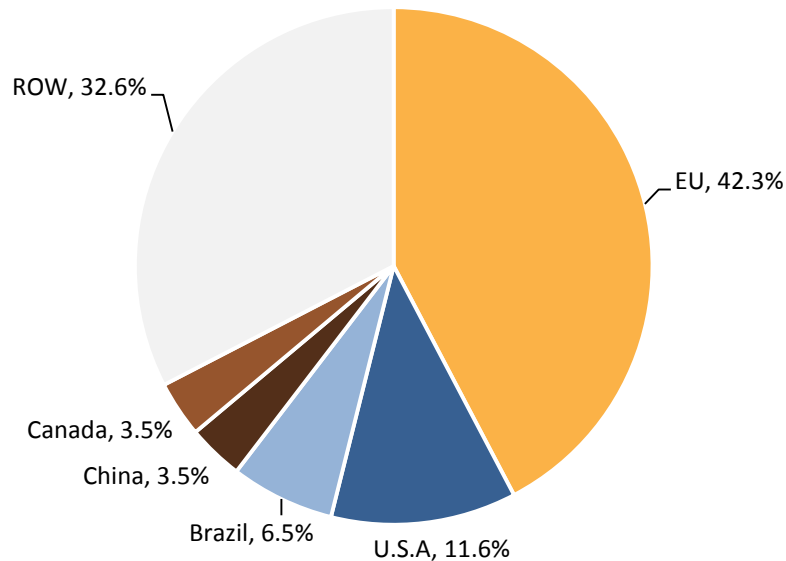
(...) Canada is a trading nation and our export markets are absolutely vital for both rural economic development and helping to contribute to feed the world. (Mr. David McInnes, President and Chief Executive Officer, Canadian Agri-Food Policy Institute, 24 April 2012)

Canada is a relatively important player internationally, accounting for 3.5% of the total value of world agricultural and agri-food exports in 2012 (Figure 3). Its main competitors are the European Union (EU),



the U.S., and the emerging countries (China and Brazil). In 2012, Canada was the fifth-largest agricultural and agri-food exporter.

Figure 3: World Agriculture and Agri-Food Export Share by Country of Origin, 2012



Source: Agriculture and Agri-Food Canada, An Overview of the Canadian Agriculture and Agri-Food System, 2014

Note: Fresh and processed seafood are not included in the data. The EU export share includes intra-EU trade.

The effect of foreign competition is felt in the domestic market as well. Several witnesses stated that Canadian consumers buy a significant percentage of imported products, depending on the product type.

The berry industry, in general, has seen increased competition from imports. Strawberry and raspberry imports are very common. With strawberries, for example, more than 84 per cent of sales in Canada throughout the year come from imported berries. (Mr. Kevin Schooley, Executive Director, Ontario Berry Growers Association, 23 October 2012)

Beth McMahon, Executive Director of Canadian Organic Growers, described competition from imports as “high,” with more than 75% of organic products being imported into Canada. Luke Harford, Vice President of Economics and Government Relations at the Canadian Vintners Association, explained that domestic sales of Canadian wines have declined from a 49% market share to a 32% market share in about 20 years.

Although witnesses acknowledged that competition was necessary to give consumers access to a wider range of products at competitive prices, they emphasized the need for Canada to stay competitive. This



competitiveness relies on product differentiation and low production costs. They stated that **the strength of competitor countries was based mainly on their ability to maintain lower production costs.**

Broccoli, for instance, arrives in Vancouver from China at certain times of the year more cheaply than I can produce it. (Mr. William Zylmans, Owner/Operator, W & A Farms Inc., 7 February 2013)

The cost of producing chicken in the U.S. is half the price it is in Canada. When you go to Brazil, it is half the price again as it is in the United States. (Mr. David Fuller, Chair, Chicken Farmers of Canada, 7 February 2012)

Some witnesses, such as Gordon Bacon, Chief Executive Officer of Pulse Canada, and David McInnes, President and Chief Executive Officer of the Canadian Agri-Food Policy Institute, believe that Canada should distinguish itself in terms of the quality, safety, and reputation of its products. James Laws, Executive Director of the Canadian Meat Council, pointed out that Canada's fresh meats, which meet domestic standards for safety and quality, rival those of its competitors in value-added markets like Japan. Kathleen Sullivan, Executive Director of the Canadian Agri-Food Trade Alliance, described outreach efforts to understand the needs of international consumers and explain Canadian production practices. Identifying what consumers want is an important step in meeting their requirements.

Committee members were also told how important it is to promote Canadian exports by developing trade agreements based on scientific evidence. Witnesses commented that the lack of scientific evidence and regulatory systems that are not science-based can lead to non-tariff barriers, which make it difficult to maintain and expand international sales of Canadian agricultural and agri-food products.

Other witnesses emphasized the importance of harmonizing food safety standards so that imports meet the same requirements as Canadian products and Canadian products can easily enter international markets.

D. Social Challenges

1. Consumer Concerns and Food Trends

a. Food Safety

It [the food safety system] has experienced a number of serious food safety incidents in recent years. The Public Health Agency of Canada estimates that 11 million Canadians suffer food-related illnesses every year. The vast majority of these are minor, but there are some major ones such as the listeriosis outbreak that caused 22 deaths. (Ms. Elizabeth Nielsen, Board Member, Consumers Council of Canada, 7 June 2012)

According to the Canadian Food Inspection Agency, food-borne illnesses can be prevented by such safe food-handling practices as cooking, cleaning, chilling, and separating. However, when a food safety issue arises within the processing system, the results can be devastating. Food safety is a priority for Canadian consumers. According to data from the Consumers Council of Canada, 74% of Canadians are concerned about food safety. Bruce Cran, President of the Consumers' Association of Canada, added that 67% of Canadians would like irradiation to be used to prevent food contamination by pathogens.



Irradiation was developed in Canada 30 years ago through roughly \$86 million in private investment. According to Mr. Cran, this technology would have prevented food crises like the listeriosis outbreak.

Consumers' concerns about food-borne illnesses affect the type of information that consumers want. In addition to details on food safety, they want to know where their food comes from and how it has been produced.

b. Nutritional Value

Nutritional value is also important to consumers, who are increasingly making the connection between their health and their eating habits. Obesity-related problems and cardiovascular diseases have caused consumers to look for healthy foods that are lower in fat, salt, sugar, and contain more antioxidants. The adoption of these new food trends has grown because of the aging Canadian population.

c. Food Security

The food supply is another concern for Canadians. Representatives from Food Secure Canada told the Committee that two million Canadians regularly experience hunger because of problems in the food distribution system.

[In Canada and internationally] the problem with hunger is not a problem of supply. The problem is not that there is not enough food. The problem is distribution. (Ms. Diane Bronson, Executive Director, Food Secure Canada, 24 April 2012)

Access to an adequate supply of safe, healthy food is one of the pillars of food security, which the FAO defines as follows:

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life.²

Responding to these concerns serves to strengthen food security in Canada.

Food security is, however, more than just having access to food. It is about having access to food that is safe, nutritious and raised with care. (Mr. David Fuller, Chair, Chicken Farmers of Canada, 7 February 2012)

d. Environment

Witnesses spoke of the importance of an environmentally responsible approach to agriculture. Canadians are aware of the impact of economic activity on natural resource use and global warming. More and more, they want food that is produced according to energy-saving and environmentally responsible practices. According to some witnesses, that is why Canadians support local food systems that they consider more sustainable.

² United Nations Food and Agriculture Organization (FAO), *The State of Food Insecurity in the World*, 2001.



e. Cultural Diversity

Canada's culturally diverse population influences dietary habits and the type of products grown in Canada.

Every five years, we get a million or so immigrants. Half of them come to Ontario and about 80 per cent of those come to Toronto. Most of those new Canadians are either Indian, Chinese or Afro-Caribbean and they come from regions where vegetables are a huge part of their diet. Our strategy up until today, since 1886, has been to teach them to eat European vegetables, to teach them to eat turnips. That is not working. They have their own needs and choices. In fact, when you ask them what they want, it creates an experiment. In that experiment we can say, out of those vegetables we can grow 12 of them in Canada, no problem. (Mr. Jim Brandle, Chief Executive Officer, Vineland Research and Innovation Centre, 16 February 2012)

Committee members were told **that multiculturalism offers an opportunity to develop new products that respond to ethnic preferences.**

2. Social Media

The advent of social media such as Facebook, YouTube, Twitter and blogs have led to changes in the agriculture and agri-food sector and forced stakeholders to rethink the way they share information.

We are heavily engaged in this [social media] at this time. Our followers are gaining in number, and we see that as a positive thing. That is the way of the future. That is the way people communicate now. (Mr. Mark Davies, Chair, Turkey Farmers of Canada, 25 October 2012)

In their testimony, witnesses indicated that stakeholders use social media to communicate among themselves and with their members. Social media are useful for communicating with the public through advertising or as part of an e-commerce strategy. However, some witnesses said that the rapid spread of digital media can sometimes make it hard to follow the information being shared. While social media can help a business grow, they can also pose certain challenges regarding a company's image.

In summary, representatives from the Canadian agriculture and agri-food sector showed that they are aware of the demographic, environmental, economic and social issues that the sector is facing. They believe it is imperative to continue adapting to these changes and to be on the forefront of innovation.

We know the way ahead will present a number of challenges that we must anticipate — population growth, world prices, dietary consumption patterns, food safety issues, non-food uses of agricultural products and climate change. The list is extensive, and we will require innovative science to stay in step (Ms. Jody Aylard, Acting Assistant Deputy Minister, Research Branch, Agriculture and Agri-Food Canada, 9 February, 2012)

PART 2

INNOVATION: A DRIVING FORCE FOR DEVELOPING THE CANADIAN AGRICULTURE AND AGRI-FOOD SECTOR



PART 2: INNOVATION: A DRIVING FORCE FOR DEVELOPING THE CANADIAN AGRICULTURE AND AGRI-FOOD SECTOR

A. The Continuum of Innovation

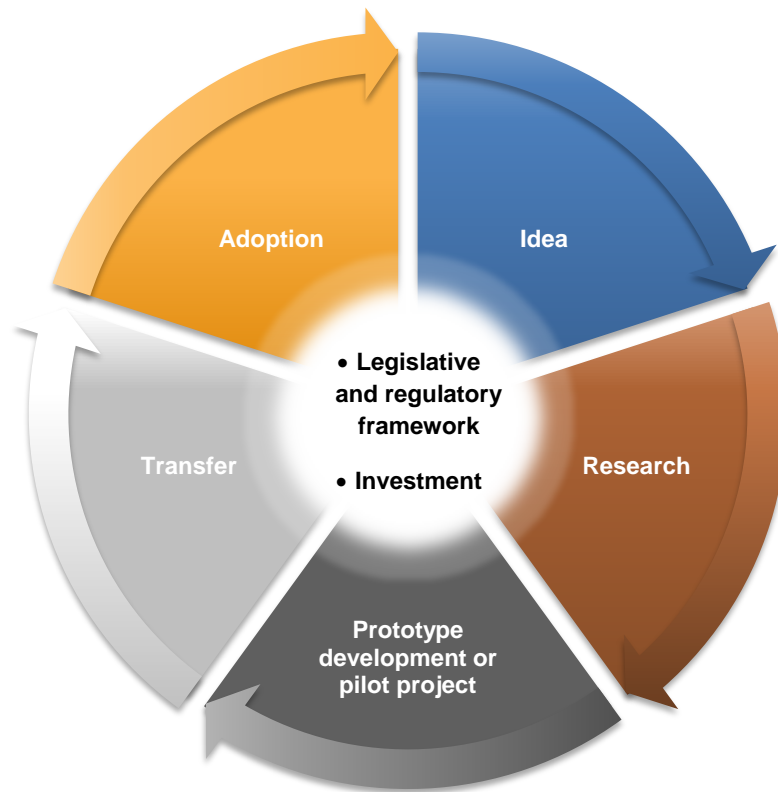
Innovation could be interpreted from different perspectives. Witnesses who defined innovation believe that innovation can result from the transformation of knowledge, a new idea, or a technological breakthrough to improve or create new business or manufacturing products, services or processes. However, as one witness pointed out in citing a definition from the Business Development Bank of Canada, innovation can also be stimulated by vision and entrepreneurship.

Innovation is really about responding to change in a creative way. It's about generating new ideas, conducting R&D, improving processes or revamping products and services. At another level, it's also about a mindset in your business: one where your staff, whether in the executive offices or on the shop floor, are always focused on continuous improvement and constantly thinking outside of the box. (Mr. Rory McAlpine, Vice-President, Government and Industry Relations, Maple Leaf Foods, 25 April 2013)

According to witnesses, innovation must also create added value. Innovation is not limited to research activities; it is therefore imperative that the innovation continuum include a commercialization stage with prototype development or a pilot project and its transfer to the field. Support activities relating to training and extension are also needed to facilitate the adoption of changes resulting from the innovation continuum. Innovation is also driven by the establishment of an appropriate legislative and regulatory framework as well as appropriate financial support measures.



Figure 4: Key Stages of the Innovation Continuum



Source: Adapted from the innovation “road map,” Science, Technology and Innovation Council of Canada

B. Federal Government Responsibilities

To create an environment that encourages research and innovation in Canada, the federal government uses a **science-based legislative and regulatory framework** to guide the introduction of new products to the market or the development of new methods. It participates in and funds research and innovation activities undertaken within government itself or in partnership with industry and academia. The government also supports stakeholders in order to facilitate the transfer and adoption of new processes or technologies.

1. Federal Departments

a. Agriculture and Agri-Food Canada

Agriculture and Agri-Food Canada plays a leading role in agricultural and agri-food research. The department’s Science and Technology Branch has currently 19 research centres across the country. In its tours of some of these centres, the Committee noted research and commercialization efforts as well as stakeholder support. Researchers at these centres are working on various aspects of production, including genomics, the development of new varieties, the development of sustainable processes and



tools, crop protection products, the effective management of crops and livestock, as well as the improvement of the quality, safety, and preservation of agricultural and agri-food products. Through collaborations with stakeholders and the operation of experimental farms and plants, research results are transferred to the field and industry for adoption by farmers and manufacturers.

The 2010 Agriculture and Agri-Food Canada science and innovation strategic action plan identified seven research priorities that focus on human health, the quality and safety of food, security and protection of the food supply, sustainable production, understanding and developing bioresources, competitiveness, and profitability.

Agriculture and Agri-Food Canada's work has also been influenced by the results of a collaborative approach based on the work of Value-Chain Roundtables (VCRTs). Launched in 2003, there are currently 11 VCRTs that bring together key stakeholders at all stages of the supply chain for a particular production category—from input suppliers to retailers to traders—as well as representatives of various levels of government. This platform facilitates the sharing of information and the establishment of research, policy, and regulatory priorities.

In addition to its research activities, Agriculture and Agri-Food Canada funds, in partnership with industry and the provinces and territories, industry-led research, commercialization, development and traceability projects under its Growing Forward 2 policy framework.

b. Canadian Food Inspection Agency

The Canadian Food Inspection Agency (CFIA) is responsible for enforcing standards and policies established by Health Canada. These policies and standards relate to the safety and nutritional quality of all food sold in Canada. The Agency plays a key role in food inspection, animal health, plant protection, and consumer protection.

To ensure that regulatory enforcement is based on scientific standards, the Science Branch oversees a network of 14 laboratories across the country. The CFIA's research strategy focuses on three priorities: food safety, animal health, and plant protection. In terms of food safety, the CFIA anticipates regulatory needs and evaluates new methods of early intervention. With regard to animal health, the CFIA works on identifying, characterizing, anticipating and preventing new animal diseases, and better managing disease outbreaks. As to plant protection, the CFIA is focused on prevention and early detection, risk evaluation, and pest and quality management. To carry out this strategy, CFIA researchers and other professionals develop new techniques, analyze scientific data, and evaluate risk.

In addition to these support activities, the CFIA—under the *Fertilizers Act*, the *Plant Protection Act*, the *Seeds Act*, and the *Feeds Act*—assesses the safety of new products, including new fertilizers, new veterinary biologics, novel feeds (including foods produced using biotechnology), and new plant varieties. As to plants with novel traits (including genetically modified plants), the CFIA and Health Canada jointly assess their safety.

The CFIA manages plant breeders' rights through the Plant Breeders' Rights Office. These rights, a form of intellectual property rights, allow plant breeders to protect their new varieties for up to 18 years. The Plant Breeders' Rights Office administers the *Plant Breeders' Rights Act (1990)*.



c. Health Canada

Health Canada's mandate is to help Canadians maintain and improve their health. The department establishes policies, regulations, standards and guidelines related to the safety and nutritional quality of all food sold in Canada. The majority of food products on the market in Canada are governed by rules and requirements set out in the *Food and Drugs Act* and its associated regulations. Other food products that manufacturers would like to sell in Canada are subject to mandatory pre-market requirements owing to their potentially higher level of risk. In particular, Health Canada reviews the safety of food additives, novel foods and infant formula prior to their commercialization based on scientific and technical information submitted by manufacturers.

Health Canada's Pest Management Regulatory Agency (PMRA) is responsible for regulating pesticides. Its mandate, under the *Pest Control Products Act*, is to protect human health and the environment from any unacceptable risk from the use of pest control products, while at the same time ensuring these products have value. Pest control products include conventional agricultural chemicals and biopesticides as well as industrial chemicals and consumer products. Only pesticides approved by the PMRA can be imported, sold or used in Canada. The PMRA's approval process is based on a scientific evaluation performed in conjunction with the United States Environmental Protection Agency.

d. Environment Canada

Under the *Canadian Environmental Protection Act*, the New Substances Notification Regulations (Chemicals and Polymers) and the New Substances Notification Regulations (Organisms), Environment Canada, together with Health Canada, evaluates potential risks to the environment, human health or the environment upon which life depends. If any risks are identified, Environment Canada is authorized to impose certain conditions or restrictions with regard to the use or import of products or substances. These evaluations also apply to biotechnology-derived animals.

2. Federal Research and Innovation Agencies

In addition to the above-mentioned federal departments, these federal agencies are involved in research and innovation, through activities or funding, in the agriculture and agri-food sector.

a. National Research Council Canada

Governed by the *National Research Council Canada Act*, the National Research Council Canada (NRC) undertakes, assists, and promotes scientific and industrial research in different fields of importance, such as crop development, human health, aerospace, and construction. In accordance with the federal government's priorities, the NRC re-focused its activities to become more industry-driven in part by supporting the commercialization of Canadian research findings. The NRC also works with Agriculture and Agri-Food Canada and Health Canada to accelerate plant breeding.

b. The Three Granting Councils

The Canadian Institutes of Health Research (CIHR), governed by the *Canadian Institutes for Health Research Act*, the Natural Sciences and Engineering Research Council of Canada (NSERC), governed



by the *Natural Sciences and Engineering Research Council Act*, and the Social Sciences and Humanities Research Council (SSHRC) are the three granting councils. Through these agencies, the federal government provides funding to university research, research training, the purchase of research tools and instruments, and the development of research infrastructure. Among the programs funded by these three granting councils, witnesses noted the Networks of Centres of Excellence program and the Canada Research Chairs program.

The three agencies have administered—in partnership with Industry Canada and Health Canada—the Networks of Centres of Excellence (NCE) since 1989. The NCE program aims to strengthen links among researchers from universities, industry, and government in order to work on critical issues facing Canada and the world. The NCE program also seeks to facilitate the transfer of technologies to the field and their adoption. In addition to the NCE program, the networks are responsible for the management of the Centres of Excellence for Commercialization and Research and the Business-Led Networks of Centres of Excellence. Today, the NCE program funds 14 virtual research centres led by various Canadian universities.

The three granting councils also manage the Canada Research Chairs program, which was created in 2000. The objective of the program is to attract and retain researchers in fields such as natural sciences, engineering, health sciences, and social sciences. Research by these chairs is designed to improve the knowledge and quality of life of Canadians while strengthening Canada's international competitiveness. The program also focuses on student supervision, teaching, and the coordination of other researcher's work.

C. Importance of Innovation for the Canadian Agriculture and Agri-Food Sector

Despite Canada's wealth of arable land and water, Canadian farmers today are able to produce more food with fewer resources. This productivity is made possible by the discovery and adoption of research-driven new technologies and processes.

Witnesses reported that research and development has made Canada an international leader in areas such as animal genetics, the development of new cultivars, and even greenhouse and climate-controlled greenhouse production.

Technological improvements and innovative processes that benefit Canadian farmers have enabled them to adopt increasingly sustainable and productive practices. These technological improvements and processes have also opened up access to new markets, in which they offer safe, high-quality nutritious products.

1. Sustainable Development

According to Environment Canada, farming practices, when conducted intensively, can have a negative impact on the quality of surface water and groundwater, soils, and GHG emissions, in particular carbon dioxide, methane, and nitrous oxide. Misuse of nutrients (nitrogen and phosphorus) and their runoff in surface water and groundwater can cause eutrophication problems. Misuse of chemicals—fertilizers and pesticides—as well as soil care and plowing can cause soil degradation, erosion, and the accumulation of these chemicals in surface water and groundwater. Although GHG emissions from the agricultural



sector have declined since 2008, Environment Canada estimated that the agricultural sector was responsible for 10% of GHG emissions in 2011.³

With a view to implementing more environmentally friendly practices, stakeholders have adopted innovative approaches and carried out research projects with promising results. It would be difficult to list all of them completely, but those that caught the attention of the Committee members are noted in the following paragraphs.

In 2009, 38 countries, including Canada, Brazil, Australia, Japan, the United States, and the United Kingdom, launched the Global Research Alliance on Agricultural Greenhouse Gases to allow members to combine their research and development efforts and transfer knowledge and technologies in order to **reduce GHG emissions resulting from farming activities.**

Private companies such as Dow AgroSciences Canada and Monsanto Canada Inc. are investing in biotechnology and advanced plant breeding to make **plants more resistant to drought and water stress.**

Researchers in the public sector and academia are striving to create “intelligent” fertilizers using nanotechnology methods that would bind in an environment where there is a surplus of water to prevent leaching into watersheds and even reduce the amount of product that has to be spread on fields. Maria DeRosa, Associate Professor at Carleton University, said that her team, in collaboration with researchers at Agriculture and Agri-Food Canada, is **developing an intelligent fertilizer that is able to respond** to signals from crops and release its nutrients into the ground in order to meet their specific nutrient needs.

Farmers are using location technologies—based on GPS tracking systems—to introduce precise amounts of seed depending on the nutrient and water content of the soil. The Canadian Fertilizer Institute has popularized a new approach based on 4R nutrient stewardship: the right fertilizer at the right rate at the right time and in the right place. This approach encourages the efficient application of fertilizers based on a balanced delivery of essential nutrients to plants in sufficient quantity to meet their needs while taking into account the nutrients already present in the soil. By conducting soil tests and using a GPS tracking system, farmers can apply fertilizer in variable doses at the right rate to avoid losses into the water or the atmosphere and at the right time by taking weather conditions into account.

Through crop rotation, farmers alternate crops through the years so that they follow each other in a certain order in a given field. This practice allows farmers to improve fertilizer management and soil conservation, while breaking pest, disease, and weed cycles.

In the area of greenhouse production, the Canadian Nursery Landscape Association noted that farmers have innovated by using dynamic greenhouse climate control to conserve energy and improve crop quality while reducing greenhouse energy consumption in winter.

³ Environment Canada, [Greenhouse Gas Emissions by Economic Sector](#), 19 July 2013 (date modified).

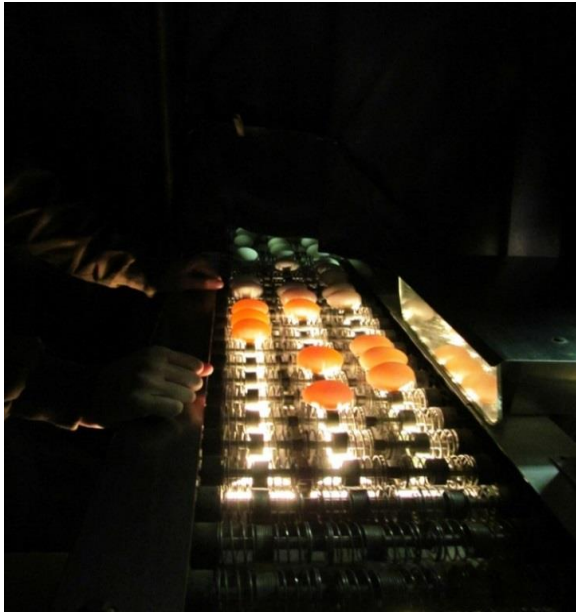


Photo: An egg candler used to inspect the eggs for cracks and other defects. This picture was taken during a committee fact-finding mission to Bayview Poultry Farms, Masstown, Nova Scotia.



Photo: This picture of a biogas generator room was taken during the committee's visit to Mr. Laforge's farm in St. André, New Brunswick, in November 2012.



Photo: In November 2012, the committee visited Mr. Jacque Laforge's farm in St. André, New Brunswick, to see how a biogas digester can convert organic waste to energy.



Photo: A Swirski-Mite sachet, a long duration sachet used as part of a biological pest program. It is used to replace pesticides at St. David's Hydroponics in the Niagara-on-the-Lake region of Ontario. The committee visited this greenhouse in February, 2014.

In its tours of some Agriculture and Agri-Food Canada research centres in Manitoba and British Columbia, the Committee saw alternatives to traditional pest control based on the use of chemicals. Committee members noted that biological control approaches—to fight against weeds and pests—are field-tested in partnership with farmers or on experimental farms. They also toured the Hylife™ Foods wastewater treatment plant in Manitoba and the Jacques Laforge biogas plant in New Brunswick, which produces methane and electricity from animal waste, biomass, and slaughterhouse waste. The electricity that is generated can supply the electrical grid and be redistributed to households or used to heat and light farm buildings. Still with respect to renewable energy, the members travelled to Nova Scotia to tour Bayview Poultry Farms, which uses wind energy to generate electricity. At the Niagara College Teaching Winery in Ontario, Committee members learned about research into integrated farming. Aquaponics, a combination of aquaculture and hydroponics, is based on creating a symbiotic



relationship between growing plants in a greenhouse and raising fish in tanks. In this system, excretions from the fish add nutrients to the water in which the plants are grown.

2. Improving Agricultural Productivity and Competitiveness

According to witnesses, improving agriculture and agri-food productivity is vital to increasing production capacity in the context of growing population demand and access to scarce natural resources. Productivity is also essential to compete with Canada's major trading partners and to continue to offer agri-food products at affordable prices. To this end, some witnesses mentioned that lowering the variable costs of production would increase Canada's competitiveness.

Witnesses recognized that innovation continues to play an important role in improving the productivity and competitiveness of the Canadian agriculture and agri-food sector. This innovation has resulted in, among other things, improved agronomic practices and the creation of new cultivars resulting from biotechnology or genetic engineering. These findings have improved crop yields and harvest periods. Kevin Schooley, Executive Director of the Ontario Berry Growers Association, explained that the harvest season for strawberries, for example, went from three weeks to five months through the use of innovative techniques such as row covers and high tunnels. Dennis Prouse, Vice-President, Government Affairs, CropLife Canada, noted that the canola yield, a crop resulting from biotechnology application, has increased by 20% in 10 years. In Agriculture and Agri-Food Canada research centres, research is being done into the genetic improvement of barley to obtain higher yields.

Genetic improvements in animal production have led to increased production of meat and meat by-products such as milk, improved animal performance (such as birth rate, growth rate, feed conversion ratio, slaughter weight, and mortality rate), and improved animal health. Jean Szkotnicki, President of the Canadian Animal Health Institute, told the Committee about the development of a new preventive vaccine to fight against circovirus in swine production. Other witnesses, such as Reynold Bergen, Research Director of the Beef Cattle Research Council, also pointed out the research undertaken by veterinary colleges in improving animal health and by universities in improving genetics.



Photo: In November 2012, the committee visited Bronson Dairy in Landmark, Manitoba, to gain firsthand knowledge of how innovation has impacted the dairy industry.

Innovation has also helped deal with difficulties in accessing competent and qualified resources, including human capital and reducing work time by automating certain agricultural activities. Committee members were able to watch dairy, viticulture, and horticulture equipment in operation. During the tour of Bronson Dairy Inc., the Committee saw a monitoring system of herd management, feed intake and environmental conditions in the buildings. At Mission Hill, the members were told that the grapes are harvested automatically to make up for labour shortages. At Cavendish Farms, the members visited a potato product cutting, packaging and processing plant.

In his testimony, Howard Mains, Canadian Public Policy Advisor, Association of Equipment Manufacturers, described some types of equipment used in agriculture.

[Agriculture equipment manufacturers] make primary tillage equipment and seed bed preparation equipment, with the planters or the harvesters being either forage harvesters or combines. (Mr. T. Howard Mains, Canadian Public Policy Advisor, Association of Equipment Manufacturers, 8 May 2012)



Rory McAlpine also pointed out the positive impact of technology on the productivity of the agri-food transformation sector.

(The meat plants under construction in Hamilton) allow us to improve productivity, increase throughput, have longer runs, fewer changeovers, improved yield, lower cost, lower overhead and increased storage and distribution efficiency. (Mr. Rory McAlpine, Vice-President, Government and Industry Relations, Maple Leaf Foods, 25 April 2013)

3. Maintaining and Developing Markets

Basically the future [of] the industry is the capacity to innovate and develop new products. (Mr. Bruno Larue, Canada Research Chair in International Agri-Food Trade, Laval University, 29 May 2012)

A number of factors such as innovation in crop development, manufacturing processes, and commercialization strategies have enhanced domestic and international market development.

A public–academic partnership led to the development of canola in the 1970s, and it is now one of the most profitable crops in western Canada.



Photo:

The committee visited the Bayer Crop Science Centre in Saskatoon, Saskatchewan, in November 2012 to learn more about the innovative work being conducted with canola plants.

Canola is a good example of how research and innovation can create success in Canada's agriculture sector. [...] Invented in the 1970s in Canada, canola is now the country's most valuable crop. Through research, the nutritional properties of canola oil and meal have been improved, and today canola is recognized as one of [the] healthiest cooking oils available. (Mr. Jim Everson, Corporate Affairs Vice President, Canola Council of Canada, May 1 2012)



Photo: Sweet cherry trees in a late-harvest experimental block at the Pacific Agri-Food Research Centre in Summerland, British Columbia. The committee visited the centre in May, 2013.

During their tour of the Pacific Agri-Food Research Centre in Summerland, British Columbia, Committee members were told about innovation efforts, including the development of a new variety of cherry, the “Sweetheart,” recognized worldwide for its quality but also for its characteristics of self-fertilization and late ripening, which can extend the growing season and the fruit harvest. **With the development of this cultivar, British Columbia’s cherry exports increased from \$500,000 a year in the 1990s to almost \$40 million in 2011.**



Photo: In the foreground of the photo can be seen lacto-fermented vegetables that have been fermented in a manner similar to sauerkraut. In the background of the photo are containers of milk and juices which have added probiotics that have been encapsulated to protect the bacteria. These are just a few of the products that Agriculture and Agri-Food Canada's Food Research and Development Centre in St. Hyacinthe, Quebec, have helped to develop. The committee visited the Centre in March, 2012.

Functional foods—defined by Agriculture and Agri-Food Canada as similar in appearance to conventional foods but demonstrated to have physiological benefits and/or reduce the risk of chronic disease—have been cited in the development of new market niches. Committee members toured the Institute of Nutrition and Functional Foods at Laval University in Québec, whose mission includes improving human nutrition through basic, applied, and clinical research on health-promoting food and molecules. Thanks to the Canadian BioPotato Network, funded by Agriculture and Agri-Food Canada, **researchers, in New Brunswick, were able to identify several varieties of coloured-flesh potatoes that are just as rich in antioxidants as blueberries.**

Research efforts are also focused on the use of agricultural products in pharmaceuticals, cosmetics, and bio-industry, creating business opportunities and promising sources of income diversification for stakeholders in the Canadian agriculture and agri-food sector. Christopher J. Hall, Chief Scientific Officer



and co-founder of PlantForm Corporation, explained that their company manufactures pharmaceuticals from plants but in a confined system. Their research and innovation activities have enabled them to produce, from tobacco, a drug with properties that are similar to Herceptin®, a drug used to fight breast cancer. These biosimilar drugs can be produced naturally or by using biotechnology. The use of plants as a production system facilitates production, harvesting, and storage activities while significantly reducing investment and production costs. According to Mr. Hall, costs would drop from \$800 million to \$80 million. In addition, this added value creates new sources of income for farmers. According to Mr. Hall, the market for biosimilar drugs is virtually untapped and has a potential value of \$100 billion by 2020.

In the area of cosmetics, the Federation of Quebec Maple Syrup Producers was able to extract bioactive molecules from maple syrup—not destined for consumption—that could be used as ingredients in cosmetic products.

The FPAQ was able to generate different types of extracts, including sugarless maple extract, MSx, which stands for Maple Syrup Extract. The MSx is a concentrate of bioactive molecules in maple that could be marketed in the cosmetics [industry.] (Ms. Geneviève Béland, Director, Innovation and Development, Federation of Quebec Maple Syrup Producers, 15 November 2011)

As to bio-industrial products, the production of biofuels from corn, wheat, or oilseeds has sparked heated debate about the use of food crops for energy production. In response, researchers are working on making cellulosic biofuels using algae, wood inputs, or other oilseed crops grown on land that does not compete with that used for food crops. Demonstration plants for the production of cellulosic ethanol are in operation in Ottawa and under construction in Edmonton. These plants aim to test the technical and economic feasibility of fermentation pathways. The Committee members also toured a Husky Energy ethanol plant in Lloydminster, Saskatchewan, where research is done to improve the fermentation pathway in order to optimize biofuel production.

Steven Fabijanski, President and Chief Executive Officer of Agrisoma Biosciences, briefed the Committee on the creation of a new strain of mustard seed used in the production of biofuel. *Brassica carinata*, marketed under the name Resonance, thrives in semi-arid areas and marginal soil. Genetic improvement of this mustard variety was done in collaboration with the NRC. The extracted oil was used to produce the biodiesel used in the NRC's Falcon 20 test flight. **It was the world's first flight of a commercial aircraft powered by pure biofuel and flying at a cruising altitude of 10,000 metres for about half an hour.**

These various examples illustrate the research and innovation efforts being made to improve manufacturing processes and the development of new products. Since 1994, Health Canada has approved 127 new foods, including 96 genetically modified crops.

Research and innovation also plays a role in enhancing product image and promotion through commercialization strategies. Agriculture and Agri-Food Canada launched the Canada Brand strategy to help companies differentiate their product from the competition on local and foreign markets and improve sales. The strategy is based on Canada Brand graphics, messaging, and landscape images.



This information can be combined with companies' marketing materials and used on their tradeshow booths and food packaging. Mark Davies, Chair of the Turkey Farmers of Canada, said that his organization has had approval since November 2011 to use the Canada Brand on its website and in its email communications. Stakeholders recognize the success of this promotion strategy.

Using a Canadian maple leaf in this brand has been used extensively in export markets and works well. The world recognizes that if it has a maple leaf, it is Canadian and high quality. (Ms. Carla Ventin, Vice President, Federal Government Affairs, Food and Consumer Products of Canada, 15 March 2012)

When you go out there in the real world and you are wearing that flag, the quality associated with it definitely attracts attention. You will get some traffic, if I may use that as an expression, because people are looking for that maple leaf. (Ms. Justine Hendricks, Vice President, Resource and Light Manufacturing Group, Export Development Canada, 29 May 2012)

Other stakeholders, including Canadian beef producers, have used producer check-offs—for example, the National Beef Check-Off—to develop innovative product commercialization strategies such as Canada Beef Inc., an independent national organization that markets and promotes Canadian beef worldwide.

During their visit to Newfoundland and Labrador, the Committee members were able to see the results of the collaboration between Quidi Vidi Brewery and the NRC to improve the brand image of Iceberg beer. Because of its packaging differentiation, this beer is sold at a premium on niche markets.

It is worthwhile to mention that identifying the needs of consumers is an important step in developing these products, given that the products are intended for them. Several witnesses told the Committee about research activities they undertake to identify consumer trends.

The OAG participates in consumer taste panels to understand what consumer preferences are in all aspects of apples, including taste, appearance, texture and colour. This work is being done with different demographic and ethnographic population groups. This helps us in our search both within Canada and globally for new apple varieties that will grow in our climate and satisfy those preferences. (Mr. Brian Gilroy, Chair, Ontario Apple Growers, 5 February 2013)

This started with our investment in a new ThinkFOOD! Innovation Centre. It is a \$12 million facility in Mississauga, Ontario, where all of our product development experts and nutritionists, microbiologists and so on work together, assessing all the issues that are affecting consumer food choices today [...] [We] are responding to what Canadians want to eat. (Mr. Rory McAlpine, Vice-President, Government and Industry Relations, Maple Leaf Foods, 25 April 2013)

Testimony also showed that bilateral and multilateral agreements provide vital support to export development.



[S]uccessful trade negotiations are needed to obtain, regain or expand market access. (Mr. Reynold Bergen, Research Director, Beef Cattle Research Council, Canadian Cattlemen’s Association, 20 October 2011)

4. Health and Nutritional Value of Foods

Canadians are increasingly interested in the nutritional value of food to reduce their risk of cardiovascular disease, diabetes and some forms of cancer. The food crises facing Canadians are another reason for their interest in access to safe food.

What is important to Canadians is the food they eat. At one time, maybe there was less focus on that, but certainly Canadian consumers have become much more aware of what they eat. They want to know that it is nutritious, the different amounts and the kind of nutrition they get from that. (Mr. David Wiens, Vice-President, Dairy Farmers of Canada, 18 October 2011)

Recognizing the needs of consumers, the industry is pursuing research and innovation to meet their expectations. In terms of the nutritional value of products, several examples of research and development activities were cited.

Dow AgroSciences Canada developed Nexera, a healthy canola oil containing omega-9. This oil is used by major food companies and allowed them to remove one billion pounds of trans fats from the diets of North Americans.

According to Health Canada, trans fats are found naturally in some animal-based foods but are also formed when liquid oils are made into semi-solid fats like shortening and hard margarine. Health Canada states that, according to scientific evidence, this dietary trans fat can increase the risk of heart disease.

Scientists at Agriculture and Agri-Food Canada have increased their knowledge of probiotics and the structure and functional attributes of foods in order to provide food products that promote people’s health. At the Guelph Food Research Centre, researchers have identified, among other findings, the link between soluble oat fibre and lower serum cholesterol levels, and between whole flax seed and lower blood cholesterol levels.

Advanced Foods & Materials Canada (AFM Canada) also highlighted several projects between industry and the academic community concerning such subjects as reducing allergies to dairy products.



Photo: A package of flaxseed kernels that have been commercially produced in Canada based on Agriculture and Agri-Food Canada’s patented flaxseed dehulling technology. Flax has a hard outer surface that can inhibit the digestion of the nutritious inside kernel when the seeds are eaten whole. The innovative process uses mechanical friction to economically remove the hull making the healthy nutrients of the kernel more easily available for use as a food ingredient. The committee visited Agriculture and Agri-Food Canada’s Guelph Food Research Centre in February, 2014.



Peter Clarke, Chair of the Egg Farmers of Canada, highlighted the organization's collaboration with universities in human health. Researchers at the University of Manitoba are examining the potential of folate in eggs to reduce the risk of heart disease or neural tube defects in babies. At the University of Alberta, researchers are examining the capacity of certain nutrients in eggs to reduce blood pressure.

Research on nutrition and functional foods is also being done at Laval University's Institute of Nutrition and Functional Foods (which Committee members toured). The Institute conducts research on nutrition and health with the aim of establishing the link between functional biomolecules, metabolism and the immune system; the effects of bioactive compounds and healthy food on individuals' health; and the link between individuals' genes and their predisposition to certain metabolic diseases for preventive purposes.

In terms of food safety, Canada's research and innovation work is recognized worldwide. Philip Sherman, Scientific Director of Canadian Institutes of Health Research, noted in his testimony that Canada discovered, in 1983, the bacteria E. Coli 0157 which is responsible for kidney failure, especially in children. Research in this field continues to evolve. Alberta Innovates Bio Solutions, in collaboration with Genome Canada and the CFIA, is using genomics technology to detect the low-level presence of listeria in the commercial transformation process.

Maria DeRosa, Associate Professor at Carleton University, explained that her team is working on the development of biosensors to detect mycotoxins that can be present in cereals.

5. Traceability

Several witnesses recognized the importance of traceability in maintaining food safety and in informing consumers about the origin and the production methods of food products. While some witnesses agree that a traceability system is not a guarantee of food safety, they admit that it plays a crucial role in achieving food safety objectives. In Canada, traceability systems across the country are mainly used in animal production and are based on animal identification, location, and movement identification. In the case of a food-borne crisis, for example, data collected by the tracking systems enable the location of the animals from the affected farm in a reasonable period of time and facilitate the withdrawal of affected products from the market or prevent their entry in the food supply chain.



Photo: An example of meat labelling provided by the Canadian Meat Council.

National organizations such as the Canadian Cattle Identification Agency and the Canadian Pork Council have established traceability systems from farm to slaughterhouse. There are also provincial



tracking systems such as the Ontario Apple Growers' Apple Tracker, Alberta Pork's traceability system, and Quebec's Agri-Traçabilité. While these traceability initiatives are for the most part initiated by producers, the Committee members noted that distribution chains such as Costco, Loblaws, and Sobeys have also implemented traceability systems to inform consumers about the origin of their products or the content of these products in antibiotics.

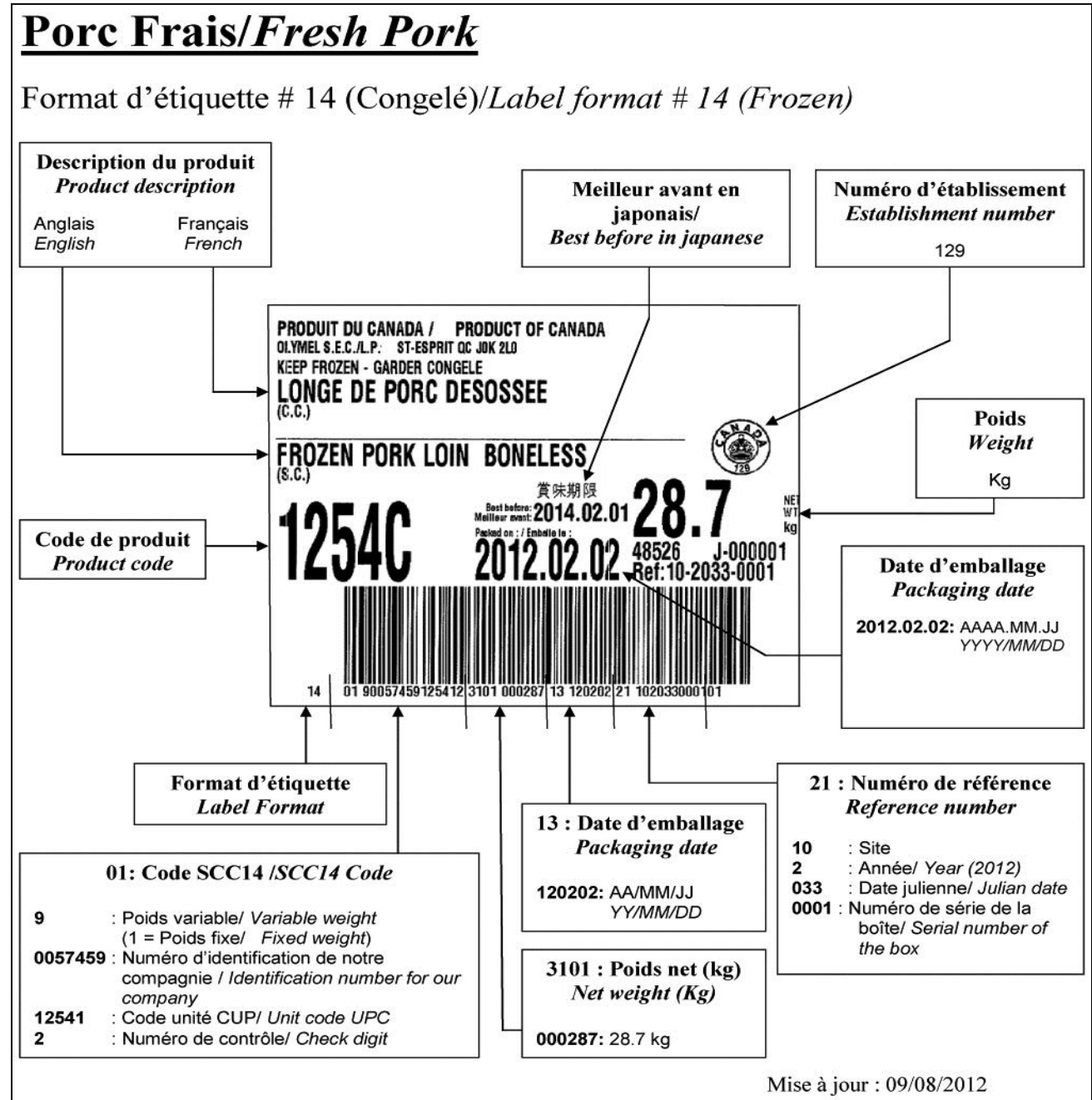


Photo: A detailed explanation of symbols and coding found on a meat label provided by the Canadian Meat Council.



In summary, witnesses recognized the importance of innovation in adopting new, sustainable agricultural practices, improving productivity and competitiveness, maintaining and developing markets, and protecting human and animal health. However, they believe that additional effort needs to be made for the Canadian agriculture and agri-food sector to derive the greatest benefit from research and innovation.

PART 3

THE NEED FOR INCREASED RESEARCH AND INNOVATION CAPACITY



PART 3: THE NEED FOR INCREASED RESEARCH AND INNOVATION CAPACITY

Canada has strong potential for scientific research. In a 2007 document entitled *Mobilizing Science and Technology to Canada's Advantage*, the Government of Canada presented its strategy on science and technology. It notes its financial support to the three granting councils as well as third parties such as Genome Canada and the Canada Foundation for Innovation. The document also mentions that

The Council of Canadian Academies has determined that most Canadian S&T is operating at or near international levels of excellence, and that Canadians are leaders in a broad range of fields important to our long-term success.

Some witnesses also acknowledged the productivity of basic research in areas such as nanotechnology:

While Canada has fewer nanotechnology researchers than larger countries such as the United States and China, we are more efficient in terms of the number of scientific articles published per researcher. (Mr. Suresh Neethirajan, Professor, University of Guelph, 16 October 2012)

However, the Government of Canada, like witnesses who appeared before the Committee, recognizes that efforts need to be made for Canadians to derive the greatest benefit from science and technology.

A. The Role of the Federal Government

Several witnesses noted that the Government of Canada should play a facilitating role in ensuring an environment that enables research, development, and innovation in the market. While not dictating decisions and strategic priorities to stakeholders in the agriculture and agri-food sector, the government should facilitate the exchange of information among stakeholders and promote public-private partnerships. **It is important that the government continue its efforts in basic research and invest, by adopting a long-term vision, in priority research areas considered as public good. While there was no consensus on what these priorities should be, the following topics were often cited by witnesses: human and animal health, the environment, market demand, production efficiency, food safety, climate change, and renewable energy.**

Witnesses also asked the government to establish a legislative and regulatory framework that facilitates quick and predictable approval and commercialization of new products and processes. Laws and regulations should also be modern and flexible in order to adapt to rapidly changing technologies and manufacturing processes. As international trade is one of the pillars of the Canadian agriculture and agri-food sector's profitability, witnesses also said that these laws and regulations need to be harmonized with those of Canada's major trading partners and be based on scientific evidence.

B. Improving and Strengthening the Regulatory Framework

1. The Approval Process for New Products

Among elements that need to be improved, witnesses identified the crop variety registration system under the *Seeds Regulations*. The Canadian Seed Trade Association (CSTA) pointed out that the



system is outdated and lacks flexibility in registering new varieties of crops such as forages and soybeans.

It is important to note that it is impossible to sell seed in Canada unless it is registered as a variety. This registration serves several purposes and is important in that it:

- ensures that health and safety requirements are met;
- provides identification and traceability of plants with novel traits;
- ensures that varieties meet the internationally recognized definition of a variety;
- acts as the repository for official variety descriptions, and the official reference seed sample, which are used to verify varieties throughout their commercial lifespan; and
- plays a role for maintaining and improving quality standards, disease tolerance and agronomic performance.

The usefulness of the registration system is not in question. However, to modernize the operational framework that dates back more than 30 years, a new, more flexible framework was proposed in July 2009. The new framework now divides into three parts Schedule III of the *Seeds Regulations*, which lists the types of seeds subject to variety registration. Three routes are now allowed. The first route, or Part I, which is similar to what is done now, requires that the crop kind or variety be recommended by an official committee and undergo up to three years of trials, be grown out in fields and be compared to check varieties. The second route, or Part II, does not require such merit assessment but does require a recommendation from a committee. The third route, or Part III of the new framework, allows application to be made directly to the CFIA, which is responsible for the seed program. Recommendation from an official committee or merit assessment is therefore not required. In order to be registered faster, crops can be transferred from Part I to Part II to Part III on a priority basis, depending on the merit of the justification and the degree of consensus within the crop value chain. However, this new framework cannot be implemented without amending the *Seeds Regulations*.

The Committee is aware that it may take time to amend the regulations due to the necessary public consultations, drafting of the amendment, its publication in the Canada Gazette, and other administrative requirements. However, the Committee notes that the new framework was proposed two years ago and that the *Regulations amending the Seeds Regulations* have already been published and even archived in Part I of the Canada Gazette. Therefore,

Recommendation 1

The Committee recommends that Agriculture and Agri-Food Canada, the Canadian Food Inspection Agency, and the Canadian Grain Commission complete the regulatory amendments of the *Seeds Act* to modernize the variety registration process.



The CSTA also noted the need to simplify the Safety Assessment Process for Plants with Novel Traits. Through this process, the CFIA is responsible for assessing the safety of these plants used in food or feed and their potential impact on the environment. Health Canada is responsible for ensuring that all foods derived from these plants are safe and nutritious. The CSTA recognizes the need for the three different assessments to avoid any risk to the environment and human and animal health, but it finds that there is very little communication between the three. This means that a company trying to get approval for an innovative product has to submit the same information and the same data to three different places on three different timelines.

Monsanto added that, although Canada's regulatory process is better than that of South Korea or Belgium because it is based on science, Canada lags behind Brazil and Argentina which have accelerated their approval process. This means that biotechnology-derived plants can be commercialized faster outside Canada which can affect the competitiveness of domestic producers. Dow AgroSciences Canada also noted that the approval process could be more predictable to allow applicants to estimate the time required to complete the process and obtain approval, modified approval, or non-approval. Applicants could then make commercial plans based on these timelines and better plan investments.

The Committee is aware of the importance of the safety assessment process for plants to protect the quality of the environment and product safety. It is therefore important that Canada maintain its position as a leader through its scientific assessment in the approval process. However, it is also important that Canadian growers maintain their competitiveness both nationally and internationally to ensure the profitability of their agricultural operations and to continue to play a leading role in Canada's rural and economic development. Therefore,

Recommendation 2

The Committee recommends that Health Canada and the Canadian Food Inspection Agency make changes to the Safety Assessment Process for Plants with Novel Traits to centralize information and data collection, accelerate the review process, and improve predictable timeframes.

With respect to the approval of plants with novel traits, the Committee was told that the commercial production of plants with novel traits for plant molecular farming⁴ is still not approved in Canada.

[A]lthough there are more than 100 plants with novel traits that have been deregulated by CFIA since the early 2000s, the CFIA fact sheet, entitled Plant Molecular Farming, states that in Canada there has been no commercial production of plants with novel traits for plant molecular farming.

⁴ According to the Canadian Food Inspection Agency, plant molecular farming is the growing of plants in agriculture to produce pharmaceutical or industrial compounds instead of food, feed, or fibre.



This means that these plants are still in the confined research trial stage under CFIA oversight and cannot be released into the environment for commercial purposes. (Mr. K. Peter Pauls, Professor and Chair, Plants and Agriculture Department, University of Guelph, 31 May 2012)

The Committee is aware that the risks posed by the possible approval of plants with novel traits for plant molecular farming for commercialization may be greater than those posed by other plants with novel traits due to the physiological effects that pharmaceutical molecules from these plants may have on living beings. However, despite these risks, the Committee notes that the United States in May 2012 and Brazil in March 2013 approved the confined commercialization of a plant-derived enzyme for the treatment of Type 1 Gaucher's disease. Therefore,

Recommendation 3

The Committee recommends that Health Canada and the Canadian Food Inspection Agency strengthen the safe, predictable, and transparent system for commercialization of plants with novel traits for molecular farming.

The need to improve the registration of new products in pest management was also noted. Under the *Pest Control Products Regulations*, the registration process not only evaluates the efficacy of the product but also the risks posed by the product and its by-products to humans and animals and their effect on organisms and the environment. However, Health Canada recognizes that the scientific tests to analyze the effects of these products on the environment should be carried out over a long-term period.

[P]art of the environmental assessment process will take into consideration how the product is applied and the residual effect from that product in the environment, whether it is persistence in the soil or in the air if it is applied by aerial spraying. We have a number of mitigation methods that our scientists put on the label, which growers have to adhere to, to minimize the residual impact of the pesticide. Where we feel that we need information is in the continual monitoring of the pesticide after application, maybe even for a number of years after a pesticide has been available for use in Canada. We can assess it based only on the application to that crop at that time. It continues to be important for us to work with the provinces to deal with monitoring data for the environmental fate of the product to know whether it is persistent in the soil, whether it is going into groundwater, and what is happening to the pesticide. (Ms. Marion Law, Chief Registrar and Director General, Pest Management Regulatory Agency, Health Canada, 14 February 2013)

The Committee also notes that the conditional registration of a pesticide is relatively long. Although this type of registration follows a full evaluation and is granted only when Health Canada would like to add



confirmatory data on the efficacy of the product or the storage of the chemical and does not want it to interfere with the product's commercialization, the Committee notes that this conditional registration can last as long as 10 to 20 years. In his March 2008 report, the Commissioner of the Environment and Sustainable Development said that some pesticides have had conditional registration for between 10 and 20 years, significantly longer than the three-year period required.

In light of this information,

Recommendation 4

The Committee recommends that:

- **Health Canada, through all relevant stakeholders, including the provinces and territories, continue its ongoing research activities related to the efficacy of pesticides and their safety for humans, animals, and on the environment; and**
- **Health Canada take the necessary action to reduce the number of conditional registrations of pest control products.**

Witnesses also raised the need to update the *Food and Drug Regulations*. Some criticized the fact that regulations are outdated and lack transparency while others deplored the slow safety assessment of food additives, novel foods (including biotechnology-derived foods and foods making nutrition claims, such as functional foods), and infant formula prior to their commercialization.

Health Canada's regulatory system that governs food additives, health claims, infant formula and novel foods is outdated and lacks transparency, timeliness and accountability. Food regulations in Canada have not kept pace with changing technologies in the development of new products. While our members develop innovative products that consumers demand[...] for introduction to the Canadian marketplace, they are not being approved by regulators in a timely manner. Canada's outdated food regulations have a negative impact on the choice of Canadians. Consumers in Canada are denied access to a variety of innovative and healthier-for-you foods available in other modern industrialized countries. (Ms. Carla Ventin, Vice President, Federal Government Affairs, Food and Consumer Products of Canada, 15 March 2012)

Witnesses attributed the slow pace of the safety assessment of food additives and nutrition claims to the required regulatory changes, which must be approved by the Governor in Council. According to Food and Consumer Products of Canada, the approval of a food additive should not require the participation of the Governor in Council because it does not have the necessary technical knowledge or scientific experience. Health Canada is the regulatory body and should be responsible for approving these products. Witnesses also criticized the lack of consistency and uniformity in interpreting the scientific and technical data required in the assessment process.



In its testimony, Health Canada's Health Products and Food Branch told the Committee that steps had been taken to accelerate the safety assessment of food additives and health claims.

In 2012, the government took a critical step forward in modernizing the food regulatory framework, laying the foundation for important reforms through targeted amendments to the Food and Drugs Act. The first amendment created a new ministerial regulation called a marketing authorization, which enables the Minister of Health to act more quickly on certain safety decisions respecting substances in or on foods such as additives, and health claims. Marketing authorizations can only be used to exempt from prohibitions at the level of the act or the regulations. They cannot be used to establish new blanket prohibitions. This still requires Governor-in-Council regulations. The second amendment provides the minister or Governor-in-Council with the authority to incorporate by reference into food regulations any document including those generated and managed by Health Canada, by other federal departments and by trusted third parties. This includes documents that may be amended from time to time. Documents can be incorporated into either a marketing authorization or into the Food and Drug Regulations themselves via a Governor-in-Council regulation. Such documents then have the force of law and are therefore enforceable. (Mr. Anatole Papadopoulos, Director of Policy, Regulatory and Government Affairs, Food Directorate, Health Products and Food Branch, Health Canada, 14 February 2013)

These amendments have reduced the time to authorize a new food additive to six months or less, including consultations on the intent to change the food additive approval process.

In light of the testimony, the Committee notes that the government has introduced measures to address some consumer and stakeholder concerns. However, the Committee found that criticism was also levelled at the lack of consistency and uniformity in the technical and scientific evaluation in the safety assessment of food additives, novel foods (including biotechnology-derived foods and foods bearing health claims, such as functional foods), and infant formula prior to their commercialization. The Committee also notes that, while the time to authorize a new food additive has been reduced to six months, this time frame does not include the evaluation of technical and scientific data. Therefore,

Recommendation 5

The Committee recommends that Health Canada, while maintaining Canada's high food safety standards, develop innovative procedures that reduce the time for the evaluation of technical and scientific data during the safety assessment of food additives, novel foods (including biotechnology-derived foods and foods bearing health claims, such as functional foods) and infant formula prior to their commercialization.

2. Animal Health

Some witnesses were concerned with the slowness of CFIA's process of regulatory and inspection modernization. Although efforts have been made to modernize the inspection process and efforts are



underway to modernize food safety regulation, witnesses noted that more effort is needed in the area of regulations on animal health, for example in disease prevention and control.

In 2012, while still delivering under its current mandate, CFIA has now begun the process of regulatory and inspection modernization and is involved in other initiatives that will basically redefine what the agency does and how they do it. Unfortunately for those of us who work on the animal health side of things rather than in food safety, the timelines are too far out, and we need to address issues like compartmentalization, health testing and lab accreditation, the availability of vaccines and pharmaceuticals, and outcome-based procedures that are all included in these packages of modernization. We have to deal with them sooner rather than later. Some members have been waiting for these things to happen for a long time already, and we have seen some companies, particularly in the poultry genetic sector, start to invest in other countries that have a friendlier regulatory system. (Mr. Rick McDonald, Executive Director, Canadian Livestock Genetics Association, 27 March 2012)

The Committee encourages the CFIA to continue its regulatory modernization of food safety, animal health, and plant protection in order to protect the environment and human and animal health. However, in terms of animal health, the Committee notes the use of antibiotics for non-medical purposes in animal feed. This issue was not discussed at length during this study because it was examined by the Standing Senate Committee on Social Affairs, Science and Technology.

The Committee believes that, in addition to focusing on animal welfare, modernization should also focus on disease surveillance and control. According to the recommendation of the National Farmed Animal Health and Welfare Council, a new surveillance plan needs to be developed and implemented. A witness said that this should not be the responsibility of the provinces alone, which could lead to a lack of uniformity in the application of biosecurity surveillance programs among provinces and possibly risk the spread of disease across the country. Therefore,

Recommendation 6

The Committee recommends that:

- **the Canadian Food Inspection Agency continue to address disease control and prevention in its modernization of animal health regulations; and**
- **the Canadian Food Inspection Agency, together with the provinces, territories, and stakeholders, work on implementing a new national disease surveillance plan.**



3. Intellectual Property

The issue of intellectual property was also raised in the testimony. In the agriculture and agri-food sector, intellectual property is usually protected through patents, trademarks, and plant breeders' rights. A patent is a form of protection granted by the government that excludes others from making, using, or selling an invention. A Canadian patent provides protection in Canada for 20 years after the filing date of the application. A trademark can be a word, symbol, or design (or a combination of these elements) used to distinguish the goods or services of a person or organization from those of others on the market. Plant breeders' rights allow a plant breeder to protect a new variety in the same way an inventor protects a new invention with a patent. Unlike patents and trademarks that are managed by the Canadian Intellectual Property Office, plant breeders' rights are managed by the Plant Breeders' Rights Office.

According to witnesses, patent protection, whether pertaining to human or animal health, gives the innovator time to recoup the costs of developing a product. However, a long examination period can reduce the length of this protection.

We are seeing in the animal health industry that in fact by the time a product, particularly on the food animal side, gets registered or licensed for use and sale in the Canadian market, there are only five years left of market exclusivity. (Mr. Jean Szkotnicki, President, Canadian Animal Health Institute, 27 March 2012)

The Committee believes that, if patent protection in Canada is 20 years and that period includes the period for evaluating the patent application, the evaluation period should be reduced or the length of the protection renewed or extended. As noted by the World Intellectual Property Organization, some countries renew or extend patent protection in the pharmaceutical and food fields. Intellectual property protection is important because it makes it possible to recoup the amounts invested in developing new products or methods. However, the Committee is aware that renewing or extending the length of patent protection can have an impact on product cost and consumers' ability to pay for these products or their by-products. Therefore,

Recommendation 7

The Committee recommends that the Canadian Intellectual Property Office review the patent application process as well as evaluate the impact of renewing or extending the length of patent protection on the Canadian market.

Other witnesses noted Canada's lack of compliance with the most recent International Convention for the Protection of New Varieties of Plants (UPOV Convention 1991). Unlike other countries like the United States or some European Union member countries, Canada has not yet ratified UPOV Convention 1991.

The consequence [of the non-ratification of UPOV Convention 1991] is twofold. Canadian plant breeders do not have adequate tools to protect their



own intellectual property, their own inventions, and they cannot regenerate the funds that are required for reinvestment, but just as important and sometimes even more important is that we cannot attract international genetics or new varieties internationally because companies will not bring their varieties to Canada because we cannot protect them in the same way they are protected in other countries. (Ms. Patty Townsend, Chief Executive Officer, Canadian Seed Trade Association, 27 March 2012)

I would say it is very important that governments recognize UPOV 91, especially for those crops that are not afforded patent protection because they are non-GM or for crops that are not hybrid. (Mr. Richard S. Gray, Professor, Bioresource Policy, Business and Economics, University of Saskatchewan, 18 October 2012)

The Committee recognizes that, although UPOV Convention 1991 places more importance on breeders' rights, article 15 of the Convention does provide an optional exception:

Notwithstanding Article 14, each Contracting Party may, within reasonable limits and subject to the safeguarding of the legitimate interests of the breeder, restrict the breeder's right in relation to any variety in order to permit farmers to use for propagating purposes, on their own holdings, the product of the harvest which they have obtained by planting, on their own holdings, the protected variety or a variety covered by Article 14(5)(a)(i) or Article 14(5)(a)(ii).

The Committee notes that this optional exception could continue to protect producers by allowing them to reuse some seeds in their operations. Therefore,

Recommendation 8

The Committee recommends that Agriculture and Agri-Food Canada and the Canadian Food Inspection Agency bring the *Plant Breeders' Rights Act (1990)* up to the standards of the 1991 Act of the International Convention for the Protection of New Varieties of Plants.

4. Nanotechnology

In addition to the need to improve the regulatory framework in the areas identified so far, witnesses stressed the need to strengthen the regulatory framework for nanotechnology.

Witnesses criticized the lack of regulation adapted to the rapid evolution of research in nanotechnology. In addition, there are no protocols for testing nanomaterials in order to avoid unforeseeable health or environmental risks. Such tests might be required before releasing products into the market.

The Committee learned from testimony that products containing nanomaterials and used in food packaging are already available on the market. Moreover, research using nanotechnology is underway



to make smart fertilizers and to detect the presence of pathogens in food. However, the lack of information about the benefits and risks of using and consuming products that use nanotechnology may raise concerns.

The stakes in terms of consumer acceptance of nanotechnology in the food sector are high, and pose a significant challenge for both government and industry. Consumers have a tendency to “practise precautionary consumption” if there is a product they are not comfortable with. It is important that the potential benefits of this technology in the area of food safety are not lost due to the risks not being identified accurately and managed. (Ms. Elizabeth Nielsen, Board Member, Consumers Council of Canada, 7 June 2012)

The Committee asked the Pest Management Regulatory Agency about an approval process to foster the commercialization of new pest control products that use nanotechnology, but the question remains unanswered.

The Committee also notes that, at Health Canada’s request, the Council of Canadian Academies carried out a study to answer the following question: What is the state of knowledge with respect to existing nanomaterial properties and their health and environmental risks, which could underpin regulatory perspectives on needs for research, risk assessment, and surveillance? In its July 2008 report, the Council of Canadian Academies stated that, while it is not necessary to create new regulatory mechanisms to address the unique challenges presented by nanomaterials, existing regulatory mechanisms should be reinforced to:

- develop an interim classification of nanomaterials;
- review the current regulatory “triggers”—i.e., the criteria used to identify when a new material or product should be reviewed for health and environmental effects—as existing mechanisms will not identify all nanomaterials and nanoproducts;
- develop standardized approaches for the proper handling of nanomaterials; and
- strengthen the current metrological capacity for nanomaterials to ensure effective surveillance of their effects on consumers, workers and the environment.

Currently in Canada nanomaterials are regulated under the *Canadian Environmental Protection Act, 1999*; the *Pest Control Products Act*; the *Fertilizers Act*; the *Feeds Act*; and the *Food and Drugs Act*. In 2007, Environment Canada and Health Canada issued a *Proposed Regulatory Framework for Nanomaterials under the Canadian Environmental Protection Act, 1999*. However, the proposal has not yet been adopted.

Aware of advances in nanotechnology and its use in the lives of Canadian consumers,



Recommendation 9

The Committee recommends that Health Canada and Environment Canada strengthen regulations on nanomaterials to reflect the recommendations made by the Council of Canadian Academies in its 2008 report. The Committee recommends that changes to the regulations be made as soon as possible.

C. International Harmonization of the Regulatory Framework

The need to harmonize the regulatory framework with those of Canada's major partners was raised, mostly with respect to approving novel products. Witnesses regretted that products approved in the United States or elsewhere are not approved in Canada within a reasonable time. According to witnesses, this inconsistency undermines the competitiveness of Canada's agriculture and agri-food sector.

Several solutions were proposed to resolve this inconsistency. According to witnesses, the scientific review should be reduced to 180 days.

We need to be able to review in 180 days if that is the standard that other countries are doing. There have been great improvements in the Canadian regulatory process, particularly with veterinary biologics in veterinary drugs. It is something we need to keep an eye on always and look to competitive review times with that of other developed countries, like that of the U.S. and the European Union. (Mr. Jean Szkotnicki, President, Canadian Animal Health Institute, 27 March 2012)

Mutual recognition of scientific data would be another way to accelerate the approval of novel products. Witnesses said that mutual recognition based on mutual trust of the scientific knowledge of partner countries would allow a product approved in Canada to also be approved in the United States or elsewhere. However, witnesses also said that exceptions could be made if the countries had different ecosystems.

The Committee notes that the Government of Canada has made efforts to harmonize its approval process for novel products with those of partner countries. The PMRA works with the United States and Mexico in the North American Free Trade Agreement (NAFTA) Technical Working Group on Pesticides. It is also active in the Organisation for Economic Co-operation and Development (OECD) Working Group on Pesticides and more recently within the Regulatory Cooperation Council. These consultations aim to build the foundations of aligned scientific approaches, including science policy, data requirements, guidance, and tools. Initiatives of the NAFTA Technical Working Group on Pesticides and the OECD Working Group on Pesticides could lead to implementing a joint scientific review. An applicant could therefore submit a single application containing the same scientific data to all the countries involved in the joint review.



[A]pproximately 75 per cent of the new agricultural chemicals approved last year for use in Canada were as a result of a joint review either with the United States or with other OECD partners. This joint scientific review approach applies both to new conventional agricultural chemicals and new technologies such as biological pesticides. (Ms. Marion Law, Chief Registrar and Director General, Pest Management Regulatory Agency, Health Canada, 14 February 2013)

As to existing pesticides, an expedited review was introduced by the PMRA to register these products if they have already been approved in other countries.

In terms of the older products that we know still have a lot of value for Canadian growers and farmers, we have another program in place with criteria that we follow if a product is registered and has associated value, the risk assessment has been done in a country where we have confidence in their regulatory system and we have the same data requirements, we would have an expedited review with these older chemicals and would be able to make them available to Canadian growers in a shorter time. (Ms. Marion Law, Chief Registrar and Director General, Pest Management Regulatory Agency, Health Canada, 14 February 2013)

As to the approval of veterinary drugs, efforts are underway so that applicants can submit their applications simultaneously to Canada and the United States.

We are doing a lot of work with the U.S. to try to do a simultaneous review. Our time is compared with what the U.S. is doing now. We are trying to convince our industry to file in both places simultaneously. (Mr. Louis Boulay, Manager, Submission and Knowledge Management Division, Health Canada, 6 October 2011)

The Committee believes that these government initiatives demonstrate the Government of Canada's commitment to harmonizing its regulatory processes with those of its trading partners. Efforts are underway with pesticides and veterinary drugs. These efforts need to continue. However, more effort is needed in the approval of other products like those that use biotechnology or nanotechnology and in the field of nutrition. Therefore,

Recommendation 10

The Committee recommends that the Government of Canada harmonize its regulations with those of its trading partners in key areas in the agriculture and agri-food sector without compromising health or the environment and that this become part of any new trade agreements.



D. Improving Funding for Research and Innovation

1. Action Strategy

There appears to be a consensus among witnesses regarding the decline in public funding for research and innovation activities. They criticized its effect on research projects, the research infrastructure, and extension, commercialization, and technology transfer activities.

Agriculture Canada beef research funding declined by 29.4 per cent, in inflation-adjusted terms, between 1995 and 2007. This came after an 18 per cent across-the-board cut in research branch funding in 1994 and 1995. This has led to declines in project funding, expertise, and infrastructure. (Mr. Reynold Bergen, Research Director, Beef Cattle Research Council, Canadian Cattlemen's Association, 20 October 2011)

Education facilities and experimental farms are retiring experts, not replacing them. The remaining top research staff are not able to do the needed research to their needed potential because they are underfunded. (Mr. Jim DeLong, Owner/Operator, DeLong Farms, 28 February 2013)

The dissemination of research findings to producers is also critical and is increasingly being lost. Both federal and provincial governments have virtually eliminated extension departments and staff. Travel budget restrictions are so onerous that most scientists are unable to participate in meetings and conferences at which they could share their research, and particularly share with producers and processors in the country. (Ms. Lianne Dwyer, Vice President, Agricultural Institute of Canada, 6 March 2012)

According to the OECD, government R&D spending in the Canadian agricultural sector has decreased significantly over the past 20 to 30 years, moving from 2.5 - 3% down to 2% (as a percentage of gross value added in the agriculture sector). Government spending in Australia and the U.S. increased from 1% to 2% in the same period.

Various witnesses told the Committee that the decline in public funding is reflected in various government activities, such as the omission of the agriculture and agri-food sector from the federal Science and Technology Strategy. Witnesses who spoke on this issue criticized the fact that the sector was left out of the strategy document *Mobilizing Science and Technology to Canada's Advantage*. They also found it regrettable that the Natural Sciences and Engineering Research Council removed the agricultural sector from its priority list.

First, how is it that the 2007 national science and technology strategy does not even mention agri-food? How did we let that happen? (Mr. Rory McAlpine, Vice-President, Government and Industry Relations, Maple Leaf Foods, 25 April 2013)

When NSERC removed the last vestige of agriculture and food from its priority list two and a half years ago, I immediately called NSERC and said that we had a problem. (Mr. Douglas Hedley, Executive Director, Canadian Faculties of Agriculture and Veterinary Medicine, 3 May 2012)



Other witnesses added that, like the United States, Canada should have a bioeconomy strategy that is integrated with Canada's economic sectors. Mr. Hedley informed Committee members that the U.S. National Bioeconomy Blueprint, released in April 2012, takes an integrated approach.

[The bioeconomy strategy describes] how to fund it; how to focus attention on it; and how to put all that together with trade, competitiveness and economic growth. (Mr. Douglas Hedley Executive Director, Canadian Faculties of Agriculture and Veterinary Medicine, 3 May 2012)

The Committee heard that Canada needs to develop a long-term vision for funding agricultural and agri-food research and innovation, particularly given the fact that scientific projects can extend over 15 to 20 years. Some witnesses stated that a long-term strategy would enable the sector to properly define its research priorities and how to achieve them. Others stated that Canada should take inspiration from the national strategies developed by Finland and Denmark, without actually imitating these countries.

We do recommend that Canadian policy incorporate longer term visioning, out at least 15 to 20 years. Policy decisions in countries like Finland and Denmark, who are out to 2050 with GHG policy, are a couple of examples of government-developed long-term visioning. (Mr. Jeff Schmalz, President, Soy 20/20, 28 February 2013)

What we are learning is that these five-year planning windows are not long enough. We have to take a longer view. Sure, governments will still work within five-year budget windows, but you have to have both. You have to have that long-term vision. (Mr. Garnet Etsell, Co-Chair of the National Food Strategy, Canadian Federation of Agriculture, 24 April 2012)

Long-term funding strategies could also help to slow the brain drain.

A beef researcher from the University of Guelph, who moved down to North Dakota State University, and, more recently, a world-renowned geneticist from the University of Alberta who went back to Australia to head up their research program because he was getting kind of tired of not being able to get long-term funding commitments in Canada. (Mr. Reynold Bergen, Research Director, Beef Cattle Research Council, Canadian Cattlemen's Association, 20 October 2011)

Witnesses added that government funding should complement private-sector funding and that the private sector should not be the sole source of support. Private-sector funding actually presents certain problems as it focuses mainly on crops that offer a return on investment, such as corn, soy, and canola. The advantage of public-sector funding is that it targets basic agronomic issues or animal-borne diseases – areas that do not always produce commercial results. The Committee heard that government investment is helpful in areas in which the economic benefits are unclear. The knowledge acquired from this basic research may be the foundation for future solutions and discoveries.

In order to return to 1994 public funding levels, witnesses stated that the government would have to invest \$26 million annually for 10 years. It was also suggested that royalties resulting from departmental discoveries be directed to Agriculture and Agri-Food Canada's research budget.



[T]he government should allow all royalty streams generated by AAFC discoveries to be added on top of the AAFC research budget. This is a no-cost way to increase the Agriculture and Agri-Food Canada research budget. (Mr. Richard Phillips, Executive Director, Grain Growers of Canada, 25 October 2011)

The Committee noted that, according to Agriculture and Agri-Food Canada data, total government support for the agriculture and agri-food sector as a share of agriculture and agri-food GDP has decreased from about 70% in the early 1990s to 33%. This decline indicates a gap between government investment and the sector's value added. Ontario Agri-Food Technologies also mentioned that government funding did not focus enough on creating value added.

The Committee also noted that Agriculture and Agri-Food Canada does not seem to have communicated its strategic action plan for science and innovation very widely. According to the department, the strategy was developed in 2006 to map out a comprehensive vision for the agriculture and agri-food sector by setting scientific objectives for the short, medium and long terms. The strategy was updated in 2010 and now identifies seven research priorities: human health; food quality and safety; security and protection of the food supply; sustainable agricultural production; understanding and developing bioresources; industry competitiveness; and profitability. The stakeholders appearing before the Committee did not mention this strategy but there seemed to be some similarity in the priorities expressed. Like Agriculture and Agri-Food Canada, witnesses highlighted health, food safety, and bioresources (such as renewable energy resources) as priorities. They also emphasized the importance of the environment, market demand, production efficiencies, and climate change.

According to the Canadian Institutes of Health Research (CIHR), one of the federal government's three granting councils, a strategic planning initiative was carried out in 2009 involving Agriculture and Agri-Food Canada, other federal departments, external partners such as volunteer-based health organizations, and researchers. The process led to food and health being identified as the number one research priority of the CIHR's Institute of Nutrition, Metabolism and Diabetes. In 2010, the CIHR allocated \$10 million to this subject area; Agriculture and Agri-Food Canada is a financial partner as well. However, the Committee noted that several stakeholders emphasized the importance of supporting research on health and food. It is unclear whether this support should be in addition to current funding or whether witnesses mentioned it because they were unaware of Agriculture and Agri-Food Canada's financial commitments in this area.



Based on this information,

Recommendation 11

The Committee recommends that

- **Agriculture and Agri-Food Canada, set common strategic priorities for science and innovation that will be part of a long-term vision and integrated with sector objectives for profitability, sustainability, and competitiveness; and**
- **Agriculture and Agri-Food Canada ensure stakeholders are fully aware of the funding from all sources that are allocated to common strategic priorities.**

2. Government Research and Innovation Incentives

a. Support for the Agriculture and Agri-Food Sector

With regard to funding programs, witnesses appreciated that the Growing Forward 2 framework focuses on innovation, competitiveness, and market development.

On the subject of agricultural innovation, we have been pretty pleased with the Agriculture Canada Growing Forward policy framework and now GF2, with its focus on innovation, competitiveness and market development. The new agricultural innovation suite of programs will result in new industry-led research, as well as new inventions and products being commercialized.
(Mr. Jeff Schmalz, President, Soy 20/20, 28 February 2013)

Among the funding programs included in Growing Forward 2, stakeholders were supportive of the AgriInnovation Program, particularly the agri-science clusters. They were very pleased that this initiative has been renewed under Growing Forward 2. The clusters align funding and priorities to achieve research outcomes that meet the needs of the agriculture and agri-food sector. They have also helped to bring together scientific and technical expertise from industry, academia, and Agriculture and Agri-food Canada to increase the sector's profitability and competitiveness. Some witnesses also mentioned that agri-science clusters, such as the organic science cluster, have served as models for similar clusters in countries such as China.

Witnesses were also pleased that the new AgriMarketing Program supports the development of domestic and export markets. The previous version of the program under Growing Forward did not take this approach.

However, opinion was divided on the amount of funding allocated to certain Growing Forward 2 programs. Some stakeholders would like to see increased funding for the AgriInnovation Program, particularly the agri-science clusters initiative, and are even prepared to increase their contribution. Others have stated that smaller industries cannot participate in the clusters initiative because the 25% participation cost is too high.



The current funding structure, which requires industry to have matching funds, needs to be re-examined. This practice makes it impossible for smaller industries to have a science cluster as other commodities do. Funding programs have to be designed to have the flexibility to allow smaller industries the opportunity to access funds to research and implement projects that increase their sector's productivity, profitability, efficiency and diversity. (Ms. Jennifer MacTavish, Executive Director, Canadian Sheep Federation, 1 November 2011)

To encourage funding for small farms, some witnesses favoured programs that are tailored to the financial capacity of various commodity sectors. According to the Nova Scotia Fruit Growers' Association, the Canadian Agricultural Adaptation Program, a five-year initiative that will end in 2014, is designed to meet the industry's financial needs. The program also has the benefit of being administered regionally by regional industry councils. The cost of industry participation is lower than for the agri-science clusters initiative. Stakeholders feel this program should be renewed.

The Ontario Berry Growers Association expressed concern over the centralization of services provided by regional adaptation councils. Historically, most of the funding was administered by regional adaptation councils, and projects were reviewed and approved by farmers in the region who sat on the council boards.

Earlier this year it was announced that this responsibility would be centralized to one location in the country. We believe that will be Ottawa, and this has been a very unpopular decision amongst many Ontario organizations, as we will not have the same input as we had in the past. (Mr. Kevin Schooley, Executive Director, Ontario Berry Growers Association, 23 October 2012)

Some witnesses were concerned by the gradual elimination of federal and provincial extension offices.

The dissemination of research findings to producers is also critical and is increasingly being lost. Both federal and provincial governments have virtually eliminated extension departments and staff. (Ms. Lianne Dwyer, Vice President, Agricultural Institute of Canada, 6 March 2012)

These offices play a key role in helping farms introduce new technologies or processes and help to overcome the "valley of death" – which the World Intellectual Property Organization defines as the period between developing new technologies and processes, and commercializing them. The offices also facilitate the transfer of technology and knowledge to the stakeholders of the sector.

b. Commercialization of Innovative Technologies:

Ontario Agri-Food Technologies also criticized the length of time required to issue project funding. It believes the administrative process must be accelerated to help companies bring new products to market.

The Committee believes that the industry's profitability depends on a diverse production structure; small- and large-scale farms both have a role to play in the economic development of the agriculture and agri-



food sector depending on the needs of the market and of the production regions. It is therefore critical for funding programs to reflect the financial needs of small and large operations.

The Committee also notes that Agriculture and Agri-Food Canada has responded to some stakeholder concerns by funding knowledge transfer and commercialization activities through the AgrilInnovation Program under Growing Forward 2. The program enables Agriculture and Agri-Food Canada research scientists and experts to access funds for knowledge transfer. However, this knowledge transfer funding seems to be offered only for the duration of a project. The Committee is of the opinion that federal government should offer on-going innovation funding and the provincial governments should offer ongoing extension services as part of the innovation continuum. These services make it possible to check the effectiveness of new technologies and processing methods over the long term and improve them as necessary.

Based on the evidence,

Recommendation 12

The Committee recommends that Agriculture and Agri-Food Canada, in cooperation with the provincial and territorial governments, continue and augment the funding of the AgrilInnovation Program and renew the Canadian Agricultural Adaptation Program or develop a similar program so that farmers can continue to resolve issues specific to their region.

Several witnesses expressed interest in reintroducing the ecoENERGY for Biofuels Program to help producers diversify their sources of revenue. They saw biofuels as a way to increase farm productivity and opportunities while protecting the environment and reducing dependency on fossil fuels. However, other witnesses felt it was unfortunate that crops used to feed livestock and people are the main sources of biofuel in North America. Producing first-generation biofuels contributed to the increased price of grains like corn.

The Committee heard that there are alternatives to using grains like wheat or corn. Demonstration plants in Ottawa – and shortly Edmonton – produce second- and third-generation biofuels using wood waste and algae. However, witnesses did say that the high production cost is one of the main drawbacks to producing this type of biofuel commercially.

In a context of oil resources depletion, the Committee recognizes the importance of reducing our dependency on oil and choosing clean energy sources. It also acknowledges the need to develop new sources of income for farmers in order to improve industry profitability. The bioeconomy is an untapped resource that could benefit the agriculture and agri-food sector. However, given the relationship between ethanol production and higher grain prices, the Committee believes that second and third generation inputs should be used to produce biofuels.



Therefore,

Recommendation 13

The Committee recommends that

- **the Government of Canada encourage the use of second- and third-generation biofuels in conventional fuel; and**
- **the Government of Canada establish funding programs to support research into and the commercialization of second- and third-generation biofuels.**

On the subject of tax incentive programs for the agriculture and agri-food sector and for the suppliers of industry inputs, there was some criticism of the Scientific Research and Experimental Development (SR&ED) Program. Witnesses were pleased such a program exists but felt that it does not meet the sector's requirements effectively. The Committee heard that the SR&ED Program is too restrictive regarding eligible expenditures in the areas of innovation and food. The definition of research should also be expanded to include technology adaptation and flexible manufacturing. In Budget 2013, the federal government proposed changes that could hinder the development of new manufactured goods useful to the agriculture and agri-food sector.

There are changes around the treatment of capital costs and also around the treatment of material costs. The changes proposed would be more favourable to other kinds of companies, such as a software development company where the development of the software is all human resources; it is all timed by individuals. However, if you take a product like the draper head that is now on the market with MacDon or other companies that manufacture goods, there are capital costs that are associated with the development of the equipment, such as the purchase of machinery to build machinery and test machinery, but there are also costs associated with actually building the equipment. While you have the design and the engineering time that goes into that, the other costs that are associated with the development of new manufactured goods would not be acceptable under the proposed changes. (Mr. T. Howard Mains, Canadian Public Policy Advisor, Association of Equipment Manufacturers, 8 May 2012)

Therefore,

Recommendation 14

The Committee recommends that the Government of Canada enhance the Scientific Research and Experimental Development Program to reflect the needs of the agriculture and agri-food sector and related sectors.



c. Support Measures for Research

Scientists appearing before the Committee expressed their concerns over the loss of research funding to purchase laboratory equipment under \$100,000.

The Canada Foundation for Innovation has major programs. We are talking millions here. That is where we go when we want to buy a machine worth \$2 million when major renovations are required, like in a hospital. Our department has been very lucky because we got one. It was a major competition. It cost \$6 million. But it is not there for buying small pieces of equipment. The last time we were advanced funding for this was in 2009. (...). Research funding for all lab equipment under \$100,000 will no longer exist as of this year. (Dr. Janice Bailey, Research Associate Dean, Faculty of Agriculture and Food Sciences, Laval University, 12 February 2013)

Witnesses also expressed the need to improve universities' agriculture and agri-food research infrastructure, and upgrades are needed to ensure that research activities can continue to be carried out over the next 30 years. Initiatives to upgrade the research infrastructure should take into account the existing research capacity at the federal and provincial levels.

Researchers are also concerned about the lack of funding to continue data sharing at the end of a project. Since the data can be used in other projects, it is critical that it be maintained and made available, particularly in subject areas such as genomics. In general, government grants support the generation of data and require it to be shared but do not provide a mechanism or platform for data sharing at the termination of a project. Moreover, data is often not shared effectively.

When people get grants, the grants may provide — may demand — the sharing of data during that grant cycle of four years or whatever it is, but they do not provide funds to continue hosting the data. (Ms. Emily Marden, Research Associate and Lecturer, Intellectual Property and Policy Research Group, University of British Columbia, 25 October 2012)

Witnesses recognize that intellectual property rights can sometimes restrict the sharing of data and knowledge. That is the reason why they called for the federal government to encourage data and knowledge sharing at an early point on the innovation continuum without negatively impacting incentives for investment or commercialization. Examples of effective information sharing tools were given, such as Flintbox, a Web application developed by the University of British Columbia. The work of the Global Crop Diversity Trust was also cited, as it may lead to the sharing of germplasm repositories, or seed banks, in various countries and to free international access.

The issue of indirect research costs was also raised. Canadian and international studies have shown that the indirect costs of research can run as high as 40% to 70% of total costs. It is sometimes difficult for universities to find funding sources for indirect costs, which can include such expenses as the operation of research facilities.

I think we need to sit down and have a candid discussion among federal funding agencies, provincial agencies, and universities about the true cost of indirect, where it is coming from, who has to share in paying it, and what the



total cost accounting is to do research in this country. (Mr. Richard D. Moccia, Associate Vice-President, Research (Strategic Partnerships), University of Guelph, 7 June 2012)

The Committee recognizes that the quality of the research infrastructure (including data-sharing platforms) has a major impact on the quality of research findings and innovation. It notes that the Canada Foundation for Innovation and the three granting councils financially support small- and large-scale research infrastructure or make their research capacity available to the scientific community.

Therefore,

Recommendation 15

The Committee recommends that

- **the Government of Canada facilitate researchers' access to suitable agricultural research facilities and equipment by means of existing funding and infrastructure programs;**
- **the Government of Canada earmark funds to develop long-term data-sharing tools when providing financial support to research projects; and**
- **the Government of Canada reinstate agri-food as a priority research area for the Natural Sciences and Engineering Research Council of Canada and the National Research Council Canada.**

3. Private Funding Issues

a. Producer Check-offs

Witnesses emphasized that private funding is just as important as public funding, particularly in the areas of applied research and technology transfer.

In Canada, farmers are able to fund research and innovation activities through check-offs, which are levies paid on products sold. The *Farm Products Agencies Act* provides for the establishment of national agricultural agencies to fund research and development activities, such as the Canadian Beef Cattle Research, Market Development & Promotion Agency.

Check-offs are also used for other types of crops such as canola, barley, wheat and pulses. This voluntary funding can support such initiatives as the creation of research chairs to explore the challenges and priorities of sector stakeholders. In the case of egg producers, financial support was given to the Research Chair in Poultry Welfare at the Ontario Agricultural College, and the Economic Research Chair on the Egg Industry at Laval University. This source of funding has also made it easier for farmers to participate in federal programs such as the agri-science clusters initiative.



Stakeholders said that when farmers can benefit from the check-offs invested in research and development, they are prepared to increase funding for research projects.

People were astounded, or happy to hear it at all. We are not just putting money into this. We are learning something from it. When they see some benefit and that it is going somewhere, they are very willing to fund it. (Mr. Reynold Bergen, Research Director, Beef Cattle Research Council, Canadian Cattlemen's Association, 20 October 2011)

Some witnesses, however, criticized the fact that check-offs are not mandatory for all farmers.

Unfortunately, our check-offs are mostly voluntary. Where it is checked off when you sell, a farmer can ask for that money back at the end of the year and does. However, we do need that industry-driven research. (Mr. Douglas Hedley, Executive Director, Canadian Faculties of Agriculture and Veterinary Medicine, 3 May 2012)

The Committee recognizes the importance of private funding for innovation and research. However, under the provisions 39 and 42(1)(e) of *the Farm Products Agencies Act*, it is up to agricultural sector stakeholders to decide whether they want mandatory check-offs. The *Farm Products Agencies Act* provides a legislative framework for mandatory check-offs.

b. Intellectual Property Rights

Intellectual property was also mentioned as another means of stimulating research and encouraging private investment. According to some witnesses, it allows innovators to recoup investments in developing new products or new technologies. However, other witnesses found that intellectual property is less than perfect for a variety of reasons. It can limit knowledge sharing, encourage concentration in the industry, and lead to an increase in prices for products developed from patented technologies.

Firms have recourse to other options to protect their innovations, such as trade secrets or non-disclosure arrangements in employment contracts with key personnel.

c. Venture Capital

Access to venture capital is another challenge in terms of obtaining private funding. Witnesses stated that financial institutions are not always interested in investing in the agriculture and agri-food sector since the return on investment is low compared with other sectors of the economy. When institutions are prepared to invest, witnesses felt that required securities are often high.

There is very little venture capital left in agriculture and that is because we are handing them ideas before they have a market-proof concept with them. (Mr. Earl Geddes, Executive Director, Canadian International Grains Institute, 16 February 2012)

We take risks, but we do not take a lot of risk. That is more for the venture capital firms. Our banks do, if there is a firm that is looking to do venture capital financing, help with non-credit products —advice, economic



forecasting, business planning strategies and that sort of non-credit advice — as well as with everyday banking needs, such as deposit and savings accounts. (Mr. Alex Ciappara, Director, Economic Analysis, Canadian Bankers Association, 2 May 2013)

Venture capital is also a determining factor in overcoming the "valley of death". Through the funding of such key activities as prototyping, venture capital facilitates the commercialization of new technologies or processes.

(We) need funding to develop a prototype and proof of the concept, et cetera. And we still do not have sufficient funds to make those links. We need to work together with tools such as the Industrial Research Assistance Program of the National Research Council of Canada, for instance, and other tools like the Canada Development Bank, which makes investments. We have a tentative culture of risk in Canada. We have to work together in order to change that and take more risks so as to create more small and medium businesses to bridge the "valley of death". (Mr. Pierre Meulien, President and Chief Executive Officer, Genome Canada, 23 October 2012)

As for access to venture capital, the Committee notes the existence of the Business Development Bank of Canada's BDC Venture Capital, and the Labour-Sponsored Venture Capital Corporations Tax Credit. It would be worthwhile assessing the performance and effectiveness of these tools to make them more accessible to the agriculture and agri-food sector.

Therefore,

Recommendation 16

The Committee recommends that the Government of Canada set policies which enhance the access of small and medium-sized enterprises (SMEs) to venture capital in order to better meet the needs of SMEs in the agriculture and agri-food sector.

E. Strengthening Collaboration and Partnerships

The Committee was told that there is a lack of cooperation among the main stakeholders involved in research and innovation. Witnesses also criticized the lack of interdisciplinary cooperation that would enable these stakeholders to work together and achieve systemic research solutions.

Witnesses admitted to a lack of cooperation in academia and in the agriculture and agri-food sector. Academic institutions have no integrated forum to enable agricultural and agri-food research universities to consolidate their research activities. The only mechanism that exists at the moment is the Canadian Faculties of Agriculture and Veterinary Medicine. The deans of the member faculties discuss issues facing the sector but do not coordinate or develop joint research strategies.



At the sector level, witnesses reiterated their support for value chains and their integrated approach to developing research strategies. Value chains should include input suppliers, farmers, processors, distribution chains and consumers. Witnesses believed that consumers are important to developing a research strategy and to implementing research results because they represent the last stage in product consumption. If consumers are not part of the decision-making process from the outset, the sector may encounter resistance to the consumption of products derived from innovation, as in the case of biotechnology products.

If we push for bold new ideas in agriculture, we have to engage farmers and the general public from the beginning and make sure they are on board. You can use the example of genetically modified food — all that science and research that went into genetically modified organisms, but the general public is not ready to accept that idea yet. (Dr. Maria DeRosa, Associate Professor, Chemistry, Carleton University, 6 March 2012)

Ignoring market needs can also hinder the transfer, commercialization and implementation of new technologies.

The transfer would be easier if there were a demand for that particular technology prior to the research taking place and the discovery being made. The more demand-driven your agricultural innovation system is, the easier it will be to transfer the results from the lab to the field. (Mr. Ken Ash, Director, Trade and Agriculture Directorate, Organisation for Economic Co-operation and Development (OECD), 28 February 2013)

Witnesses emphasized that interdisciplinary cooperation can prevent a disconnect between research and the needs of industry and the marketplace. Lack of communication can lead to the duplication of research efforts in terms of human, financial and materiel resources.

(...) we found out that there were researchers in British Columbia doing the same thing as researchers in P.E.I., but neither one of them knew what the other was doing (...). We have to get them to communicate as well so that we are not duplicating and so that our government monies are being spent wisely. For the same project, let us spend on one. (Mr. William Zylmans, Owner/Operator, W & A Farms Inc., 7 February 2013)

Consequently, the various participants need to work together and create a synergy that leads to better results.

We do not want to be off doing separate things when we can work better. We know we could be more powerful working synergistically. (Mr. Philip M. Sherman, Scientific Director, Canadian Institutes of Health Research, 23 October 2012)

Another advantage to multidisciplinary projects is that they enable an issue to be examined from different angles so that an effective solution can be produced.



To address the lack of communication, some witnesses suggested encouraging the creation of agencies for different types of crops, similar to the Canola Council of Canada. Others suggested following the example of the Research and Development Corporations in Australia. They are funded through levies paid by producers, supplemented by public funding. The corporations promote cooperation between industry, government, and researchers; the government plays a support role. Witnesses also offered the example of Embrapa, a Brazilian agricultural research organization that brings together farmers and the scientific community. It was also suggested that funding programs be established to develop collaborative forums bringing together academics, funding agencies, and agriculture and agri-food sector stakeholders. Other witnesses stated that the coordination process should be initiated solely by the private sector so that it is not affected by the political cycle.

Interdisciplinary cooperation should also apply to federal research agencies and departments.

There is certainly the perception of a silo mentality among the various government departments, the research granting councils and so on. Far more than in the past, we need to create a climate of cooperation. (Mr. Pierre Meulien, President and Chief Executive Officer, Genome Canada, 23 October 2012)

Based on the evidence heard, the Committee notes that forums for cooperation among industry stakeholders exist. Some witnesses mentioned such structures as national associations for producers and processors, the Retail Council of Canada, consumer organizations, the three granting councils, and the Canadian Faculties of Agriculture and Veterinary Medicine. Representatives from Agriculture and Agri-Food Canada also mentioned the work of the Value Chain Roundtables (VCRTs) in bringing together key stakeholders from the entire supply chain. It would be helpful to foster cooperation among these organizations through existing forums such as the VCRTs. However, the Committee believes that the roundtables' work could be strengthened by including consumers, representatives from academia, and stakeholders from other federal agencies and departments – depending on industry needs.

Therefore,

Recommendation 17

The Committee recommends that Agriculture and Agri-Food Canada strengthen vertical and interdisciplinary collaboration by fostering communication with consumers, academia, and federal departments and agencies interested in agricultural and agri-food issues.

F. Eliminating Non-Tariff Barriers to International Trade

Witnesses praised the federal government's efforts to sign multilateral and bilateral trade agreements to remove tariff and non-tariff barriers and increase export markets for Canadian products. They also encouraged the government to continue to ensure that trade agreements rely on scientific principles.



What the Government of Canada could do in that case is continue the work of advocating science-based policies, which our Minister of Agriculture does at every opportunity, when he can, to ensure that policies are based on science and that they are fair and equal; and also, through trade arrangements and treaties, look for ways to ensure that we are not only negotiating to reduce tariffs but are also negotiating to ensure that regulations are applied in a fair way and based on science. (Mr. Jim Everson, Corporate Affairs Vice President, Canola Council of Canada, 1 May 2012)

The Committee heard that some countries lack a scientific basis for their approval process. This situation leads to the creation of non-tariff barriers and sanitary and phytosanitary measures⁵, and hinders trade relations, as in the case of biotechnology-derived foods.

For the last three years we have gone into a trade deficit situation in seed because our customers in the European Union are requiring affidavits declaring that there is zero genetically modified material. (Ms. Patty Townsend, Chief Executive Officer, Canadian Seed Trade Association, 27 March 2012)

However, with the creation of the Market Access Secretariat in 2009, the Government of Canada is pursuing the objective of improving market access. According to witnesses, the coordination efforts between the industry stakeholders and the various federal departments including Agriculture and Agri-Food Canada, the CFIA and Foreign Affairs, Trade and Development Canada, facilitate the achievement of this objective.

Other stakeholders raised the issue of maximum residue limits for certain products used in agriculture. When these limits differ between countries, they can be detrimental to agricultural and agri-food trade. It can also be difficult and costly to meet maximum residue limits for products that are approved for commercialization in Canada but not abroad. Limits are recommended by the Codex Alimentarius Commission. However, some witnesses noted that the Commission's standards are not up to date.

Unfortunately, Codex is years and years behind. Thirteen of seventeen products we use in lentils do not have a Codex standard, which creates great uncertainty in a trade environment. (Mr. Gordon Bacon, Chief Executive Officer, Pulse Canada, 25 October 2011).

The Committee recognizes that the goal of the Codex Alimentarius Commission is to develop international food standards, guidelines and codes of practice to ensure safe and healthy foods.

⁵ According to the World Trade Organization, these are measures dealing with food safety, and animal and plant health. Measures can include import restrictions or maximum residue levels.



Therefore,

Recommendation 18

The Committee recommends that the Government of Canada continue its work on the Codex Alimentarius Commission in order to better harmonize pesticide maximum residue limits and thereby promote the elimination of sanitary and phytosanitary barriers.

Committee members were told that access to market data is essential. Witnesses complained that they had to consult U.S. data to obtain strategic market information. In the fruit and vegetable sector, for example, the lack of data may hinder the signing of trade agreements or the preparation of economic analyses to identify new market niches. According to the Canadian Produce Marketing Association, the current Infohort system is underfunded and under-resourced.

Therefore,

Recommendation 19

The Committee recommends that Agriculture and Agri-food Canada improve the strategic market information available to sector stakeholders in order to effectively meet their needs.

G. Other Support Measures for the Agriculture and Agri-Food Sector

Witnesses raised more general issues about facilitating research and adopting new technologies. Professional development for farmers was one such subject. Some said that agriculture was not simply about working the land or raising animals. Farmers also need access to proper training in farm management and risk management so that they can better anticipate operating costs, investment costs, and profitability. As some witnesses said, this type of training will lead to “smarter farming” and enable the creation of value-added products through efficient and effective access to new technologies or processes. Access to such innovations will also facilitate the modernization of farm practices.

To address this issue, some witnesses suggested that access to funding programs be conditional on submitting a viable business plan.

Witnesses also highlighted the need to increase public understanding of the agriculture and agri-food sector in order to dispel negative public perceptions about the use or approval of new technologies, and possibly attract newcomers to the industry. Young people seem more interested by the business world



but, as some witnesses pointed out, there is a business side to agriculture and agri-food as well. The public is not well informed about this aspect of the industry.

Although agriculture is not part of Canada's educational curriculum, witnesses said that it does not necessarily need to be. It is more important to show young people the wide choice of careers available in agriculture.

I think we have to be careful not to get too caught up with the fact that agriculture is not in curriculum. Agriculture is very science-based, and feeding the world is going to involve innovation. Where we have to connect with students is exactly there; they can go into agriculture and they can be researchers, scientists, marketers or lawyers (Ms. Johanne Ross, Executive Director, Agriculture in the Classroom-Manitoba, 15 May 2012)

Many stakeholders complained about the shortage of skilled workers in the agriculture and agri-food sector. This shortage is felt on farms, in slaughterhouses and in processing plants, and in related areas of employment such as engineering and scientific research.

The industry needs new, highly trained, educated people to move the industry forward. There is absolutely a concern about getting new people trained. (Mr. Reynold Bergen, Research Director, Beef Cattle Research Council, Canadian Cattlemen's Association, 20 October 2011)

According to some stakeholders, it is imperative that Canada design adequate post-secondary education and immigration policies in order to link training programs with the sector's requirements.



CONCLUSION

In pursuing this study, the Standing Senate Committee on Agriculture and Forestry wanted to examine the challenges facing the Canadian agriculture and agri-food sector and how research and innovation can help stakeholders overcome these challenges while adapting to the changing landscape in which they operate.

To do so, the Committee undertook fact-finding missions to Canada and the United States. The members visited farmers and agricultural organizations, Agriculture and Agri-Food Canada research centres, academic and private research facilities, processing plants and biofuel manufacturing plants. The Committee also held hearings in Ottawa, hearing from 170 witnesses from across the supply chain, including farmers, processors, consumers, researchers, academics, financial institutions and representatives from provincial agencies, federal departments and agencies, and international organizations. The Committee notes that technological advances have enabled stakeholders to meet consumers' needs in terms of respect for the environment and product quality and safety while remaining productive and competitive on the domestic and international market.

However, witnesses expressed their need to operate in an environment that facilitates research and innovation so that they continue to benefit from efforts invested in the above-mentioned areas. They commented on the need for improving and strengthening the regulatory framework, improving funding, strengthening cooperation and partnerships, pursuing trade agreements based on scientific foundations, farmer training, access to qualified human resources, and public awareness of agricultural realities.

In response to these concerns the Committee made a series of recommendations to the Government of Canada, including Agriculture and Agri-Food Canada, Health Canada, the Canadian Food Inspection Agency, and Environment Canada. The Committee hopes that these recommendations will be seen as an opportunity to increase the contribution of research and innovation in the development of the Canadian agriculture and agri-food sector.



APPENDIX A: WITNESSES

**WITNESSES WHO APPEARED DURING THE 1ST SESSION OF THE 41ST
PARLIAMENT (JUNE 2, 2011 - SEPTEMBER 13, 2013)**

ORGANIZATION	NAME, TITLE	DATE OF APPEARANCE
Agriculture and Agri-Food Canada	Jody Aylard, Acting Assistant Deputy Minister, Research Branch	February 9, 2012
	Gilles Saindon, Director General, Science Centres Directorate	
	Kristina Namiesniowski, Assistant Deputy Minister, Markets and Industry Services Branch	March 21, 2013
	Frédéric Seppey, Chief Agriculture Negotiator and Director General, Trade Agreements and Negotiations Directorate	
	Fred Gorrell, Director General, Market Access Secretariat	
Agricultural Institute of Canada	Lianne Dwyer, Vice President	March 6, 2012
Agriculture in the Classroom – Manitoba	Johanne Ross, Executive Director	May 15, 2012
Agrisoma Biosciences Inc.	Steven Fabijanski, President and Chief Executive Officer	October 25, 2012
Agri-Traçabilité Québec	Marie-Christine Talbot, General Director	April 23, 2013
	Lyne Ravary, Coordinator, Development and Automation Directorate	
Alberta Innovates Bio Solutions	Stan Blade, Chief Executive Officer	October 30, 2012



Alberta Pork	Darcy Fitzgerald, Executive Director	April 16, 2013
Art Enns & Sons Ltd	Art Enns, Owner/Operator	May 9, 2013
As individuals:	Jacques Laforge Peter Clark John M. Weekes	October 18, 2011 March 13, 2012 March 13, 2012
Association of Equipment Manufacturers	T. Howard Mains, Canadian Public Policy Advisor	May 8, 2012
Atlantic Council for Bioenergy Cooperative	Ken Magnus, Executive Director	February 26, 2013
BIOTECCanada	Andrew Casey, President and Chief Executive Officer	October 25, 2012
Bio-Terre Systems Inc.	Élise Villeneuve, Chief Operation Officer	March 29, 2012
British Columbia Innovation Council	John Jacobson, Chief Executive Officer	October 30, 2012
Canada Pork International	Jacques Pomerleau, President	March 13, 2012
Canadian 4-H Council	Mike Nowosad, Chief Executive Officer Sue Walker, Director of Development and Provincial Relations	May 15, 2012
Canadian Agri-Food Policy Institute	David McInnes, President and Chief Executive Officer	April 24, 2012



Canadian Agri-Food Trade Alliance	Kathleen Sullivan, Executive Director	March 13, 2012
Canadian Animal Health Coalition	Mark Beaven, Executive Director Dr. Ed Empringham, Senior Project Manager	March 7, 2013
Canadian Animal Health Institute	Jean Szkotnicki, President	March 27, 2012
Canadian Bankers Association	Alex Ciappara, Director, Economic Analysis, Canadian Bankers Association David Rinneard, Director, Agriculture and Agribusiness, BMO Gwen Paddock, National Manager, Agriculture, Royal Bank of Canada Peter Brown, Director, Agriculture, Scotiabank Stacey Schrof, Manager, Agriculture Policy and Process, TD Canada Trust Darryl Worsley, National Director, Agriculture, CIBC	May 2, 2013
Canadian Cattle Identification Agency	Darcy Eddleston, Chair Brian Caney, General Manager	March 7, 2013
Canadian Cattlemen's Association	Reynold Bergen, Research Director, Beef Cattle Research Council Ryder Lee, Manager of Federal Provincial Relations	October 20, 2011



Canadian Co-operative Association	Lynne Markell, Government Affairs and Public Policy Advisor	February 28, 2012
Canadian Federation of Agriculture	Garnet Etsell, Co-Chair National Food Strategy	April 24, 2012
Canadian Fertilizer Institute	Kristian Stephens, Senior Manager, Technical Affairs Robert Godfrey, Senior Manager, Policy	November 24, 2011 October 30, 2012
Canadian Food Inspection Agency	Tony Ritchie, Executive Director, Plant Health and Biosecurity Directorate Dr. Primal Silva, Executive Director, Animal Health Science Directorate Dr. Martine Dubuc, Vice President, Science Paul Mayers, Associate Vice-President, Policy and Programs Branch	October 6, 2011 October 6, 2011, February 9, 2012 February 9, 2012 March 21, 2013
Canadian Honey Council	Rod Scarlett, Executive Director	November 15, 2011
Canadian Horticultural Council	Anne Fowlie, Executive Vice-President	October 27, 2011
Canadian Institutes of Health Research	Philip M. Sherman, Scientific Director Paul Bélanger, Assistant Director	October 23, 2012
Canadian International Grains Institute	Earl Geddes, Executive Director	February 16, 2012
Canadian Livestock Genetics Association	Rick McDonald, Executive Director	March 27, 2012



Canadian Meat Council	James M. Laws, Executive Director	April 18, 2013
Canadian Nursery and Landscape Association	Victor Santacruz, Executive Director	October 23, 2012
Canadian Organic Growers	Beth McMahon, Executive Director	April 26, 2012
Canadian Pork Council	Jurgen Preugschas, Chair, Board of Directors Catherine Scovil, Executive Director Jeff Clark, Manager, PigTrace Canada	November 1, 2011 April 18, 2013
Canadian Poultry Research Council	Jacob Middelkamp, Chairman	February 7, 2012
Canadian Produce Marketing Association	Ron Lemaire, President Jane Proctor, Vice President, Policy and Issues Management	October 27, 2011
Canadian Renewable Fuels Association	W. Scott Thurlow, President	October 16, 2012
Canadian Seed Trade Association	Patty Townsend, Chief Executive Officer	March 27, 2012
Canadian Sheep Federation	Jennifer MacTavish, Executive Director	November 1, 2011
Canadian Vintners Association	Luke Harford, Vice President, Economics and Government Relations	November 29, 2011
Canadian Young Farmers' Forum	Justin Beck, Past Chair	February 28, 2012



Canola Council of Canada	Lisa Campbell, Research Manager	May 1 st , 2012
	Jim Everson, Corporate Affairs Vice President	March 6, 2012
Carleton University	Maria Derosa, Associate Professor, Chemistry	March 6, 2012, October 16, 2012
Cattlemen's Young Leaders Program	Joanne Solverson, Cattlemen's Young Leaders Graduate	May 9, 2013
Chicken Farmers of Canada	David Fuller, Chair	February 7, 2012
Conference Board of Canada	Len Coad, Director, Energy, Environment and Technology Policy	October 18, 2012
Conseil de la transformation alimentaire et des produits de consommation	Sylvie Cloutier, President and CEO Carole Fortin, Vice President, Communications and Public Affairs Dimitri Fraeys, Vice President, Innovation and Member Relations Jean-Pierre Lacombe, President, Groupe R&D Richard Cloutier, President and CEO, Centre québécois de valorisation des biotechnologies (CQVB)	May 17, 2012
Consumers' Association of Canada	Bruce Cran, President	June 7, 2012
	Mel Fruitman, Vice-President	March 19, 2013
Consumers Council of Canada	Elizabeth Nielsen, Board member	June 7, 2012
Cool Climate Oenology and	Kevin W. Ker, Research Associate and	February 14, 2012



Viticulture Institute Brock University	Professional Affiliate	
Costco Canada	Stuart Shamis, Corporate Counsel Janet Shanks, Vice-President of Fresh Foods	May 7, 2013
CropLife Canada	Dennis Prouse, Vice President, Government Affairs	November 24, 2011
Dairy Farmers of Canada	David Wiens, Vice-President	October 18, 2011
DeLong Farms	Jim DeLong, Owner/Operator Ralph DeLong, Owner/Operator	February 28, 2013
Domaine de Grand Pré	Hanspeter Stutz, President	February 14, 2012
Dow AgroSciences Canada	Jim Wispinski, President	June 6, 2013
Egg Farmers of Canada	Peter Clarke, Chair Bernadette Cox, Manager, Corporate and Public Affairs	November 3, 2011
Environment Canada	David Morin, Acting Director General, Science and Risk Assessment Jim Louter, Manager, Biotechnology Section	October 6, 2011
Export Development Canada	Justine Hendricks, Vice-President, Resource and Light Manufacturing Group	May 29, 2012
Fédération de la relève agricole du Québec	Frédéric Marcoux, President	February 28, 2012



Federation of Quebec Maple syrup producers	Anne-Marie Granger Godbout, Executive Director, Market Geneviève Béland, Director, Innovation and Development	November 15, 2011
Food & Consumer Products of Canada	Carla Ventin, Vice President, Federal Government Affairs	March 15, 2012
Food Secure Canada	Anna Paskal, Senior Policy Advisor Diana Bronson, Executive Director	April 24, 2012
Genome Canada	Pierre Meulien, President and Chief Executive Officer	October 23, 2012
George Morris Centre	Larry Martin, Senior Fellow Kate Stiefelmeyer, Research Associate	May 8, 2012
Grain Farmers of Ontario	Henry VanAnkum, Chair Terry Daynard, Consultant	October 16, 2012
Grain Growers of Canada	Richard Phillips, Executive Director	October 25, 2011
Greenfield Ethanol	Malcolm West, Vice President, Finance and Chief Financial Officer	October 16, 2012
GS1 Canada	Mike Sadiwnyk, Senior Vice President, Industry Relations	April 18, 2013
Health Canada	Jeff Farber, Director, Bureau of Microbial Hazards Jason Flint, Director, Policy and Regulatory Affairs Division	October 6, 2011



	<p>Louis Boulay, Manager, Submission and Knowledge Management Division</p> <p>Marion Law, Chief Registrar and Director General, Pest Management Regulatory Agency</p> <p>Anatole Papadopoulos, Director, Bureau of Policy, Regulatory and Governmental Affairs, Food Directorate, Health Products and Food Branch</p>	February 14, 2013
J. Yorga Farms Ltd	Jeff Yorga, Owner/Operator	May 9, 2013
La Face Cachée de la Pomme	François Pouliot, President	February 14, 2012
Laval University	<p>Bruno Larue, Canada Research Chair in International Agri-food Trade</p> <p>Janice Bailey, Research Associate Dean, Faculty of Agriculture and Food Sciences</p> <p>Grant Vandenberg, Associate Member, The Institute of Nutraceuticals and Functional Foods</p>	<p>May 29, 2012</p> <p>February 12, 2013</p>
Manitoba Pork	Andrew Dickson, General Manager	April 16, 2013
Maple Leaf Foods	Rory McAlpine, Vice-President, Government and Industry Relations	April 25, 2013
Monsanto Canada	<p>Mike McGuire, President</p> <p>Brian K. Treacy, Vice-President, Regulatory Affairs</p> <p>Trish Jordan, Vice-President, Public and Corporate Affairs</p>	June 4, 2013



National Research Council Canada	Dr. Roman Szumski, Vice-President, Life Sciences (National Bioproducts Program) Jerzy P. Komorowski, General Manager, Aerospace, Engineering	December 6, 2012
New Brunswick Maple Syrup Association	Yvon Poitras, General Manager	November 15, 2011
Nova Scotia Fruit Growers' Association	Dela Erith, Executive Director	February 5, 2013
Ontario Apple Growers	Brian Gilroy, Chair	February 5, 2013
Ontario Berry Growers Association	Kevin Schooley, Executive Director	October 23, 2012
Ontario Greenhouse Vegetable Growers	George Gilvesy, General Manager	June 13, 2013
Organic Agriculture Centre of Canada	Andrew Hammermeister, Director	April 26, 2012
Organisation for Economic Co- Operation and Development	Ken Ash, Director, Trade and Agriculture Directorate Catherine Moreddu, Senior Analyst, Trade and Agriculture Directorate	February 28, 2013
PEI BioAlliance Inc.	Rory Francis, Executive Director	April 30, 2013
Pelee Island Winery	Walter Schmoranz, President	February 14, 2012
PlantForm Corporation	J. Christopher Hall, Chief Scientific Officer	May 31, 2012



Potash Corp	Jeff Holzman, Director, Market Research	October 30, 2012
Pulse Canada	Gordon Bacon, Chief Executive Officer	October 25, 2011
Retail Council of Canada	David Wilkes, Senior Vice President, Grocery Division Karen Proud, Vice President, Federal Government Relations	May 15, 2012 May 7, 2013 May 15, 2012
Soil Conservation Council of Canada	Don McCabe, President	May 1 st , 2012
Solidarité rurale du Québec	Claire Bolduc, President	June 13, 2013
Soy 20/20	Jeff Schmalz, President	February 26, 2013
The Canadian Faculties of Agriculture and Veterinary Medicine	Douglas Hedley, Executive Director	May 3, 2012
Turkey Farmers of Canada	Mark Davies, Chair Phil Boyd, Executive Director	October 25, 2012
University of British Columbia	Ed Levy, Adjunct Professor, Intellectual Property and Policy Research Group Emily Marden, Research Associate and Lecturer, Intellectual Property and Policy Research Group	October 25, 2012
University of Guelph	Kari Dunfield, Assistant Professor, Department of Land Resource Science K. Peter Pauls, Professor and Chair, Plants & Agriculture Department	March 29, 2012 May 31, 2012



	<p>Richard D. Moccia, Associate Vice-President, Research (Strategic Partnerships)</p> <p>Suresh Neethirajan, Bionano Lab</p> <p>John Cranfield, Professor, Department of Food, Agricultural and Resource Economics</p> <p>Sylvain Charlebois, Associate Dean, College of Management and Economics</p>	<p>June 7, 2012</p> <p>October 16, 2012</p> <p>October 18, 2012</p> <p>March 19, 2013</p>
University of Manitoba	Michael Trevan, Dean of the Faculty of Agricultural and Food Sciences	May 3, 2012
University of Montreal	Dr. Bruce Murphy, Professor and Director, Center for Animal Reproduction Research, Department of Veterinary Biomedicine	March 6, 2012
University of Saskatchewan	<p>Peter W.B. Phillips, Professor, Johnson-Shoyama Graduate School of Public Policy</p> <p>Richard S. Gray, Professor, Bioresource Policy, Business and Economics</p> <p>Dr. Reuben Mapletoft, Distinguished Professor, Department of Large Animal Clinical Sciences</p> <p>Dr. Sheila Schmutz, Department of Animal and Poultry Science</p> <p>Dr. James Dosman, Distinguished Research Chair</p>	<p>May 3, 2012</p> <p>October 18, 2012</p> <p>February 5, 2013</p> <p>February 7, 2013</p>
Vincor Canada	Josie Tyabji, Director Western Estates and Industry Relations	February 14, 2012



Vineland Research and Innovation Centre	Jim Brandle, Chief Executive Officer	February 16, 2012
W & A Farms Inc.	William (Bill) Zylmans, Owner/Operator	February 7, 2013
West End Food Co-op	Lynn Bishop, Co-op Coordinator	February 28, 2012



APPENDIX B – FACT-FINDING MISSIONS

FACT-FINDING MISSION TO QUEBEC – MARCH 7-9, 2012

ORGANIZATION	NAME, TITLE
Agriculture and Agri-Food Canada, Food Research and Development Centre, Saint-Hyacinthe, Quebec	Michel Britten, Research Scientist Claude Champagne, Research Scientist Jean Gagnon, Plant Manager Alain Houde, Research Director Gabriel Piette, Scientific Director
Laval University, Institute of Nutrition and Functional Foods (INAF)	Janice Bailey, Assistant Dean of Research, Faculty of Agricultural and Food Sciences Mr. Yves Desjardins, Director, Horticulture Research Centre (CRH) Mr. Yves Pouliot, Acting Director of the Dairy Science and Technology Research Centre (STELA) and Director of the Institute of Nutrition and Functional Foods (INAF)
Research and Development Institute for the Agri-Environment (IRDA)	Mr. Mathieu Girard, Researcher Ms. Gisèle Granbois, President and CEO Mr. Thomas Jeannes, Research Associate Mr. Roch Joncas, Associate Scientific Director Mr. Daniel-Yves Martin, Researcher Ms. Lise Potvin, Technician, Research and Development
Savoura, St-Étienne-des-Grès Greenhouse	Terry Jacobs, Engineer Isabelle Prévost, Crop Manager



<p>University of Montreal</p>	<p>Michel Carrier, Dean, Faculty of Veterinary Medicine</p> <p>Serge Messier, Associate Dean of Student Affairs and Undergraduate Programs / Faculty Secretary, Faculty of Veterinary Medicine</p> <p>Eliane Auger, Manager, Quebec Reproduction Network (RQR), Faculty of Veterinary Medicine</p> <p>Christopher A. Price, Ph.D., Professor, Animal Reproduction Research Centre (CRRRA), Faculty of Veterinary Medicine</p> <p>Lawrence Smith, Ph.D., Professor, Animal Reproduction Research Centre (CRRRA), Faculty of Veterinary Medicine</p>
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FACT-FINDING MISSION TO WASHINGTON, D.C. – MARCH 19-21, 2012

ORGANIZATION	NAME, TITLE
American Farm Bureau Federation	Dale Moore, Deputy Executive Director, Public Policy Dave Salmonsens, Senior Director, Congressional Relations
American Seed Trade Association	Leslie Cahill, Vice President, Government Affairs
Embassy of Canada, Washington D.C.	Ambassador Gary Doer, Ambassador of Canada to the United States of America Jeanette Patell, First Secretary, Agriculture & Fisheries Sean Sunderland, Counsellor, Intergovernmental Relations Pauline Walsh, Customs and Immigration
Library of Congress	Carl W. Ek, Specialist in International Relations, Foreign Affairs, Defense and Trade Division, Congressional Research Service Ian F. Ferguson, Specialist in International Trade and Finance, Foreign Affairs, Defense and Trade Division, Congressional Research Service Remy Jurenas, Specialist in Agricultural Policy
National Association of Wheat Growers	Jane DeMarchi, Director of Government Affairs for Research and Technology
National Council of Farmers Cooperatives	Chick Conner, President and CEO Kevin Natz, Vice President



North American Millers Association	Jim Bair, Vice President
United States Department of Agriculture	<p>Dr. Ann Bartuska, Deputy Under-Secretary, Research, Education, and Economics</p> <p>John Cordts, Branch Chief, Animal and Plant Health Inspection Service</p> <p>Franz Hochstrasser, Confidential Assistant, Research, Education, and Economics, Congressional Research Service</p> <p>J.P. Passino, Director, Foreign Agricultural Service</p>
United States House of Representatives	<p>Jack Kingston (R-GA), Representative, Chairman of House Appropriations, Subcommittee on Agriculture, Rural Development, FDA, and Related Agencies</p> <p>Sam Farr (D-CA), Representative, Subcommittee on Agriculture, Rural Development, FDA, and Related Agencies</p> <p>Glenn Thompson (R-PA), Representative</p> <p>Rick Crawford (R-AR), Representative</p> <p>Mike Conaway (R-TX), Representative</p> <p>Jonah Shumate, Chief of Staff, Office Representative Rick Crawford (R-AR)</p> <p>Paul Balzano, Legislative Director, Office of Representative Mike Conaway (R-TX)</p> <p>Lee Bobbitt, Legislative Assistant, Office of Representative Mike Conaway (R-TX)</p> <p>Matt Schwartz, Staff Director, Agricultural Subcommittee, Office of Representative Mike Conaway (R-TX)</p> <p>Mike Dunlap, Subcommittee Staff Director, Agriculture Committee</p> <p>John Goldberg, Science Advisor, Agriculture Committee</p> <p>Chris Leggett, Counsellor, Agriculture Committee</p>



	<p>Patricia Straugh, Deputy Counsel, Agriculture Committee</p> <p>Michelle Webber, Subcommittee Staff Director, Agriculture Committee</p> <p>Lauren Sturgeon, Legislative Assistant, Agriculture Committee</p>
United States Senate	<p>Carolyn Laird, Station Manager, Special Projects, Republican Policy Committee</p>
World Bank	<p>Juergen Voegele, Director of the Agriculture and Rural Development Program</p> <p>Marie Lucie Morin, Executive Director</p> <p>Tuuka Castrén, Senior Forestry Specialist, Agriculture and Rural Development Program</p> <p>Yourie Tanimichi Hoberg, Senior Economist, Agriculture and Rural Development Program</p> <p>Jonathan Rotshchild, Senior Advisor</p>



FACT-FINDING MISSION TO THE PRAIRIE PROVINCES – NOVEMBER 4-10, 2012

ORGANIZATION	NAME, TITLE
Agriculture and Agri-Food Canada, Brandon Research Centre	Dr. Byron Irvine, Operations Director Dr. Huston Block, Research Scientist Dr. Katherine Buckley, Research Scientist Dr. Cynthia Grant, Research Scientist Dr. Bill Legg, Research Scientist
Agriculture and Agri-Food Canada, Lacombe Research Centre	Dr. Manuel Juarez, Acting Director of Operations/Livestock, Phenomics Scientist Dr. Jeff Stewart, Director of Research and Development Dr. Jennifer Aalhus, Meat Quality Scientist Dr. Vern Baron, Sustainable Production Systems Scientist Dr. Neil Harker, Weed Ecology & Crop Management Scientist Dr. Kelly Turkington, Sustainable Production Systems Scientist Dr. Xianqin Yang, Meat Microbiology Scientist Rosanne Oswald, Executive Assistant for the Director of Operations
Archer Daniels Midland Company Biodiesel Plant	Mark Matlock, Senior Vice-President Research Mike Deck, Plant Manager Kris Kappenman, General Manager Biodiesel Peter Polansky, Bio Diesel Project Engineer Mark Symington, Senior Merchandizer
Bayer Crop Science	Stewart Brandt, North America Breeding Manager, Canola Breeder



	Conor Dobson, Director, Public & Government Affairs, Bayer Crop Science
Bronson Dairy Inc.	Russ Braun, Owner/Operator
Husky Canada	Kent Miller, Lloydminster Ethanol Plant Manager Drew Pritchard, Husky Lloydminster Upgrader Operations Manager Adam Sparkes, Director of Government and Community Relations
Hylife Pork Plant	Claude Vielfaure, Chief Operating Officer Denis Vielfaure, Chief Operating Officer Howard Siemens, Senior Vice President Business Development Gord Hancox, Vice President Operations Alan Pickard, Director of Operations Thor Eiriksson, Director of Product and Sales Management Kevin Cook, Cut Floor Manager Bob Dagg, Cut Floor Supervisor Rick Poitras, Cut Floor Supervisor Sharon Soroka, Cut Floor Supervisor Clayton Young, Kill Floor Manager Carl Koversky, Kill Floor Supervisor Don Green, Special Projects Abelardo Dizon, Cut Floor Associate (guest Chef) Therese Touchette, Office Coordinator
Olds College School of Innovation	Dr. H.J. Thompson, President Bob Clark, Vice Chair, Board of Governors Jordan Cleland, Vice-President Advancement



	<p>Neil French, Instructor, School of Agriculture</p> <p>Brad Mcleod, Coordinator, Meat Processing Program</p> <p>Laurie Newsham, Instructor, Arboriculture</p> <p>Barb Dixon, Executive Assistant</p>
Pound-Maker Feedlot	<p>Brad Wildeman, President</p> <p>Keith Rueve, Ethanol Plant Manager</p> <p>Sheri Pedersen, Administrator</p> <p>Brooke Pedersen</p>
Richardson Oilseed Limited	<p>Pat Van Osch, Vice-President and General Manager</p> <p>Darrell Sobkow, Assistant Vice-President, Operations</p>
University Manitoba, Bruce D. Campbell Farm and Food Discovery Centre	<p>Michael Trevan, Dean, Faculty of Agricultural and Food Sciences</p> <p>Siobhan Maas, Programmes Coordinator</p> <p>Guy Robbins, Visitor Services Manager</p> <p>Ran Ukashi, Government Relations Associate, University of Manitoba</p> <p>Crystal Jorgenson, Communications Specialist, Faculty of Agricultural and Food Sciences</p>
Windy Creek Farms	<p>Jim Janzen, Owner/Operator</p> <p>Ronalee Janzen, Owner/Operator</p>



FACT-FINDING MISSION TO THE ATLANTIC PROVINCES – NOVEMBER 25-28, 2012

ORGANIZATION	NAME, TITLE
Agriculture and Agri-Food Canada, Fredericton Potato Research Centre	Claudel Lemieux, Director of Research & Development Manon Proulx, Acting Director of Operations Benoit Bizimungu, Research Scientist Helen Tai, Research Scientist Yvan Pelletier, Entomologist Xianzhou Nie, Research Scientist - Molecular Virology Bernie Zebarth, Research Scientist Sheng Li, Research Scientist - Hydrology/Croplands and Water Management
Agriculture and Agri-Food Canada, Kentville Research Station	Christiane Deslauriers, Director General Mark Hodges, Director of Operations Greg S. Bezanson, Research Scientist – Food Safety Dale Hebb, Research Biologist Andrew Jamieson, Fruit breeding and genetics Wilhelmina Kalt, Research Scientist - Food Chemist
Bayview Poultry Farms	Glen Jennings, Owner/Operator Lisa Jennings, Owner/Operator Cecil Jennings Blake Jennings Patti Wyllie, General Manager, Nova Scotia Egg Producers



Cavendish Farms	Bill Meisner, Vice President, Operations Jamie Mackenzie, Director of Operations Zenaida Ganga, Crop Specialist
Collège communautaire du Nouveau-Brunswick	Lise Ouellette, Acting Director, Edmundston campus Jean-Louis Daigle, Executive Director, Eastern Canada Soil and Water Conservation Centre Josée Landry, Head of Operations/Researcher, Bio-refinery Technology Scale-up Centre Sylvain Poirier, Vice-President – Innovation and Institutional and International Development, Training and Employment Josée Rioux-Walker, Department Head, Centre of Excellence in Agricultural and Biotechnological Sciences, Grand Falls Campus Rick Saulnier, Applied Research and Innovation Development Officer, Training and Employment Kevin Shiell, Researcher, Bio-refinery Technology Scale-up Centre Mandy Poitras, Communications Officer
Jacques Laforge Farm	Jacques Laforge, Owner/Operator
Masstown Market	Laurie Jennings, Owner/Operator
McCain Potato Processing Technology Centre	Allison McCain, Chairman John Doucet, President & CEO, Day & Ross Transportation Group Mark McCauley, Vice-President, Business Development, McCain Foods Limited Brian Ruff, Facility Manager



	<p>Michael Sahagian, Principal Scientist Daniel Beaulieu, Technologist Analytical Services Sherri Gerrow, Laboratory Assistant</p>
Moncton University	<p>Paul É. Bourque, Dean, Health Sciences and Community Services Neil Boucher Vice-Rector, Learning and Research Pascal Audet, Director, Food Research Centre Natalie Carrier, Director, School of Food Science, Nutrition and Family Studies Étienne Dako, Professor, School of Food Science, Nutrition and Family Studies Marc Surette, Professor, Department of Chemistry and Biochemistry Denyse LeBlanc, Food Research Centre</p>
Oxford Frozen Foods	<p>John Bragg, President and Co-CEO David Hoffman, Co-CEO Graham Wood, General Manager</p>



**FACT-FINDING MISSION TO ST. JOHN'S
NEWFOUNDLAND AND LABRADOR – MARCH 25-26, 2013**

ORGANIZATION	NAME, TITLE
Agriculture and Agri-Food Canada, Atlantic Cool Climate Crop Research Centre	Sandy Todd, Director of Operations Peggy Dixon, Research Scientist, Entomology Samir Debnath, Research Scientist, Biotechnology, Propagation and Breeding Allan Kwabiah, Research Scientist, Nutrient Management Darryl Martin, Research Technician, Biotechnology, Propagation and Breeding Wayne Molloy, Research Technician, Nutrient Management
Canada Bread Atlantic	Weldon Peddle, Plant Operations Manager Stephanie Martheleur, Quality Assurance Supervisor Patricia Slaney, Machine Operator, Bread Line
Glenview Farm	David Walsh, Owner/Operator Denise Walsh, Owner/Operator Crosbie Williams, Owner/Operator, Pondview Farm Dr. Erin Ramsay, Regional Veterinarian, Government of Newfoundland and Labrador
Newfoundland Chocolate Company	Brent Smith, Chief Chocolate Officer
Quidi Vidi Brewing Company	Hugh McDermott, General Manager



FACT-FINDING MISSION TO BRITISH COLUMBIA – MAY 29 – JUNE 1ST, 2013

ORGANIZATION	NAME, TITLE
Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre	Kenna MacKenzie, Director of Operations Barry Grace, Director of Research & Development Pascal Delaquis, Research Scientist (Food Safety) Cheryl Hampson, Research Scientist, Plant Breeding (Apple and Cherry) Tom Lowery, Research Scientist (Viticulture) David Theilmann, Research Scientist (Crop Protection – Biotechnology)
BC Fruit Growers Association	Jeet Dukhia, President Glen Lucas, General Manager
Caramoomel Natural Fine Food Creations	Alex Dudka, Farmer Antonia Dudka, President and Chief Product Developer Catalina Dudka, CEO, marketing
Mission Hill Wines	Douglas Goldsby, Vice-Chairman David Wilson, Vice President of Finance Dave Fallis, Vice President, Operations John Simes, Vice President of Winemaking Viticulture Barinder Singh Sall, Director of Government and Regulatory Affairs, Mark Anthony Group Inc.
Nk'Mip Cellars	Sam Baptiste, Prior Chief, Osoyoos Indian Band and Vineyard Manager Josie Tyabji, General Manager Justin Hall, Assistant Winemaker



S. Sundher Orchards Ltd. and GP Sandher Holdings Ltd.	Bill (Bir) Sandher, Owner-Operator Dave (Sukhdev) Sandher, Owner-Operator Gurtag Sandher Parminder Sandher Sukwinder (Suki) Sandher
Sun-Rype Products Limited	Dave McAnerney, President & CEO Lesli Bradley, Vice President, Operations Amanda Burns, Vice President, Finance & CFO Warren Sarafinchan, Vice President, Supply Chain & Information Technology John Madsen, Director of Engineering Services Tammy Robichaud, Quality & R&D Manager Nicole Stansfield, Manager, Human Resources & Corporate Administration, and Corporate Secretary
Tamarac Fresh Cut Foods Ltd.	Tony DiMaria, President/Owner-Operator



FACT-FINDING MISSION TO ONTARIO – FEBRUARY 5-7, 2014

ORGANIZATION	NAME, TITLE
Advanced Foods and Materials Canada Inc.	Larry Milligan, Chairman of the Board Rickey Yada, Scientific Director and Professor, Canada Research Chair in Food Protein Structure at University of Guelph Perry Lidster, Managing Director Michael DiPaul, Project Manager and Business Development Officer Allan Paulson, Scientific Director
Agriculture and Agri-Food Canada, Guelph Food Research Centre	Gabriel Piette, Research and Development Director Puni Piyasena, Director of operations Sampathkumar Balamurugan, Research Scientist Steve Cui, Research Scientist Joshua Gong, Research Scientist Susan Tosh, Research Scientist Qi Wang, Research Scientist
Agri-Technology Commercialization Centre	Jeff Schmalz, CEO, Soy 20/20 Dave Smardon, President and CEO, Bioenterprise Gord Surgeoner, President, Ontario Agri-Food Technologies
Maple Leaf Food Innovation Centre	Michael McCain, President & CEO Gary Maksymetz, President, Maple Leaf Consumer Foods Andrew Pollock, Senior Vice President, Marketing and Innovation Rory McAlpine, Vice President, Government and Industry Relations



	<p>Darlene Macdonald, Senior Director, ThinkFOOD!</p> <p>John Webb, Director, Emerging Science</p>
Niagara College	<p>Dan Patterson, President</p> <p>Allan Schmidt, Chair, Niagara Board of Governors</p> <p>Marc Nantel, Associate Vice-President of Research and Innovation</p> <p>Mike Duncan, Industry Research Chair</p> <p>Al Unwin, Chair of Horticulture</p> <p>Rob Walters, Senior Advisor to the President of Niagara College</p> <p>Craig Youdale, Acting Dean, Niagara College's Canadian Food and Wine Institute</p> <p>Steve Gill, General Manager Niagara College Teaching Winery and Niagara College Teaching Brewery</p> <p>Nigel Corish, Research Project Manager, Food and Beverage Innovation portfolio</p> <p>Michael Olson, Chef</p> <p>Mark Picone, Chef</p> <p>Terence Van Rooyen, College Winemaker and Instructor, Viticulture Program</p> <p>Gavin Robertson, Instructor, Viticulture Program</p> <p>Amy Proulx, Researcher & Industry Liaison, Culinary Innovation & Food Technology</p> <p>Becky Scott, Student</p> <p>Chris Heagle, Student</p> <p>Jessica Reese, Student</p>
Southbrook Vineyards	<p>Bill Redelmeier, Proprietor</p> <p>Paul Campbell, Sales and Marketing Director</p>



	Christine Montana, Retail Manager
St. David's Hydroponics	Henry Stienstra, Sales Manager Marty Hendrickson, Senior Grower George Gilvesy, General Manager, Ontario Greenhouse Vegetable Growers
University of Guelph	Rob Gordon, Dean, Ontario Agricultural College John Livernois, Associate Vice-President, Research Rich Moccia, Associate Vice-President Strategic Partnerships Dirk Steinke, Director of Education and Outreach, Biodiversity Institute of Ontario Erin Skimson, Manager, Catalyst Centre Gary Torraville, Business, Student and Community Support Manager Sue Bennett, Director, University and Community Relations