



## Introduction

In July, 2003, Agriculture and Agri-Food Canada (AAFC) invited a number of academic and government science experts to review its research programs and provide advice and feedback on a strategic framework for AAFC science and innovation.

Based on recommendations and advice from this Science Advisory Panel, AAFC has developed the following Strategic Framework for Science and Innovation.

## AAFC Strategic Framework for Science and Innovation

The Framework consists of six (6) key elements:

### *1. Doing the Right Things*

The objective is to ensure that AAFC research efforts are aligned with the strategic outcome priorities identified by the agriculture and agri-food sector, the Department and the Government of Canada.

This is accomplished through a strategic planning process informed by ongoing regional and national consultations.

### *2. Doing Things Right*

The objective is to ensure the technical excellence of AAFC science.

This is accomplished through a combination of internal and external reviews by scientific experts before research projects are undertaken, during their conduct and after their completion.

### *3. Building Integrated National Science and Innovation Capacity*

The objective is to ensure that comprehensive science and research capacity exists in Canada to support the sustainable profitability and growth of the agriculture and agri-food sector and to fulfill the mandate of the Government and the Department.

This element has four integrated components:

- a) a long-term strategy for investment in capital assets to ensure access to state-of-the-art facilities and equipment needed to support research relevant to the sector and the Government
- b) a long-term strategy for the retention, attraction and development of the scientific expertise needed to address strategic priorities of the sector and the Government, now and in the future
- c) a partnership strategy for achieving an optimum balance between AAFC science and research and the capacities, capabilities and efforts of other science and research providers in Canada
- d) innovative funding mechanisms that support the development and conduct of integrated research efforts focused on addressing priorities of the sector, the Department and the Government



#### ***4. Accelerating the Rate of Adoption and Commercialization of Scientific Knowledge***

The objective is to contribute to the establishment of a business climate that promotes the rapid diffusion of scientific knowledge and supports the development of new economic opportunities for the sector and Canadians leading to increased jobs and growth.

This is accomplished through the development of innovative mechanisms for registering, managing and packaging *Intellectual Property* as well as through programming that supports the establishment of value chains and strategies to develop and market new products, new processes, and capture new market opportunities.

#### ***5. International Science and Research***

The objectives are: (1) to gain access to expertise and capabilities that exist anywhere in the world through innovative and strategic partnerships and joint ventures with international science and research providers, (2) to share Canada's expertise with other nations to assist in the advancement of good international relations, and (3) to extend Canada's global influence in international policy, scientific and regulatory development through developing greater international recognition of the quality of Canada's scientific expertise, capabilities and advice.

#### ***6. Science Communications***

The objective is to ensure improved understanding and increased application of science and research results to the sustainable profitability and growth of the agriculture and agri-food sector, to understanding the scientific basis for improved policies and programs, and to the enhancement of the quality of life of Canadians.

This is accomplished through the development of science communication strategies for key audiences including:

- a) the global science community
- b) the domestic agriculture and agri-food sector
- c) government policy makers
- d) the general public



## Consultation Overview

Since the establishment of the Research Branch of the Canada Department of Agriculture in 1886, departmental science has provided solutions for Canada's agriculture and agri-food sector. Research efforts constantly adjust to address the evolving issues facing the sector.

As we enter the 21<sup>st</sup> Century it seems clear that the agriculture and agri-food sector is facing new challenges and opportunities in the areas of food safety and quality, environmentally responsible production, risk management, biosecurity, and in the emerging bioeconomy.

In this context, AAFC ensures that its efforts are applied in areas of federal government responsibility and at the same time, works to ensure that there are no gaps in the national science capacity needed to support sustainable profitability and growth for the sector.

To this end, AAFC is looking to take advantage of opportunities to better balance departmental efforts with other players in the research community nationally and to ensure the collective science investments and research efforts by governments, universities, and the private sector are used to Canada's greatest advantage.

AAFC recognizes the need and the value for a review of both the strategic directions for departmental science and the management of research efforts and resources.

On June 23, 2005, Minister Andy Mitchell announced a review of science priorities and an approach to launch the next phase of Agriculture and Agri-Food Canada's science strategy.

The core of this approach is a comprehensive consultation process with stakeholders, industry representatives, provincial and territorial governments, universities, research institutes and communities leading to a national Agriculture Science and Innovation Symposium in the Fall of 2005.

The primary purpose of this consultation process is to ensure the ongoing relevance and capacity of agricultural research to meet the changing needs of the agriculture and agri-food sector, the Government of Canada and Canadians.

## Objectives

Overall, the process is designed to allow the Department to seek advice and solicit feedback on:

- a strategic vision for the Canadian agriculture and agri-food sector for the 21<sup>st</sup> century, leading to identified mission-critical science and research areas for AAFC action,
- regional and national objectives and research priorities within these mission-critical areas,
- the appropriate role for AAFC in the context of the national science and research community including governments, universities and the private sector,
- the AAFC partnership strategy for building integrated national science capacity supporting the agriculture and agri-food sector.



Advice from consultations will be taken into consideration in identifying agriculture and agri-food research needs and priorities, and defining where the Department must engage to address current and emerging opportunities and challenges facing producers, processors, the Government and Canadians.

Consultations will also provide information on the science capacity required to help the Canadian agriculture and agri-food sector achieve sustainable profitability and growth in the 21<sup>st</sup> Century, as well as help guide the Department in making decisions on human, capital and financial resources.

## Consultation Initiatives

AAFC will conduct a review of its priorities by holding a first "Agriculture Science and Innovation Symposium" and will use existing and new initiatives to maintain continuous interaction with regional stakeholders to ensure AAFC is doing the right things.

### Agriculture Science and Innovation Symposium

The Symposium will bring together regional and national representatives of agricultural producers and processors along with stakeholders including federal, provincial, university, and industry decision-makers responsible for strategic investment in agriculture science capacity, research efforts, and innovation initiatives, as well as from rural communities and other communities of interest.

It will provide an opportunity for stakeholders to review the results of consultations to date, and to provide advice and feedback on the research priorities for AAFC, as well as on the development of a holistic, national approach to building integrated agricultural science and research capacity in support of the agriculture and agri-food sector, the Government and Canadians.

One hundred agricultural producer and agri-food processor representatives, along with up to fifty representatives from other stakeholders, will be invited to the first Agriculture Science and Innovation Symposium to be held in Ottawa on November 22<sup>nd</sup> and 23<sup>rd</sup> 2005.

## Other Consultation Venues

### 1. Science Advisory Board

A Science Advisory Board (SAB) composed of up to 15 representatives from the academic community, producer organizations, industry, government, and social and natural science has been established to advise the Deputy Minister of Agriculture and Agri-Food Canada regarding the strategic relevance of the science and research capacity, capabilities and issues focus of AAFC science and research.

A special consultation with the SAB seeking advice and feedback on a vision for the agriculture and agri-food sector, and the science capabilities and research priorities needed to support this vision, will be held in the fall of 2005.

### 2. Regional Advisory Committees

In all parts of Canada, new advisory committees composed mostly of producers and food industry representatives, will be put in place to ensure ongoing regional and local input to the development of AAFC research priorities.

There are two key objectives:

- (1) to seek advice and solicit feedback on research priorities that would help producers and the sector address regional challenges and opportunities over the next decade; and



- (2) to seek advice on an approach to developing ongoing regional advice and feedback on departmental research priorities.

As a first step, representatives from various regional agricultural organizations and stakeholder groups will be invited to participate in discussion to be held in the fall of 2005. They will be asked to express their opinions on the best suited avenues for ensuring their views are included in ongoing priority setting processes.

They will also have a first opportunity to provide comments on the AAFC science and innovation framework, and to propose research priorities for their industry and the sector as a whole.

### *3. Value Chain Roundtables*

A number of commodity-oriented Value Chain Roundtables have been organized under the Agricultural Policy Framework (APF) to provide an opportunity and a mechanism for producers, processors and other value chain stakeholders to define requirements in support of increased market development and capturing export opportunities.

As a part of this consultation process, AAFC will seek advice and feedback on research priorities from Value Chain Roundtables at their regularly scheduled meetings over the summer and early fall.

### *4. Consulting Partners*

In today's environment, agriculture and agri-food science has no frontier. It is rapidly expanding in new directions such as human nutrition, pharmaceuticals, and non-food commercial products. It is important to consult with outside partners on a regular basis to ensure science capacity is strong and complementary.

Consultations on a regular basis will be conducted with:

- Senior officials in federal science-based departments and agencies
- Senior officials in provincial government science-based departments and agencies
- Deans of Agriculture and Veterinary Colleges and other senior university officials.

### *5. The Canadian Agri-food Research Council (CARC)*

CARC, an independent organization supported financially by AAFC, has a large and diversified membership of government, university, producer, and industry representatives. CARC identifies agriculture and agri-food research priorities and requirements and formulates recommendations for action by all the research communities interested in agricultural science, including AAFC. The CARC Executive Committee has already been consulted for advice and feedback on research priorities at their regularly scheduled meeting this summer.



## A Strategic Vision for the Sector

Canada's agriculture and agri-food sector is a key contributor to the high quality of life enjoyed by citizens across the country. It is also vital to our nation's economic success, currently producing some eight per cent of our gross domestic product, and accounting for one in eight jobs nation-wide. Primary agriculture is the second largest primary sector in Canada. Food and beverage processing is the largest manufacturing sector in six of our ten provinces, and is the second largest manufacturing sector in Canada.

The Canadian agriculture and agri-food sector faces a number of challenges and opportunities as we enter the 21<sup>st</sup> century. Sustainable profitability and growth for the sector will depend on how it responds to these challenges and opportunities.

### *Challenges and Opportunities*

Global agriculture has experienced a radical transformation both structurally and technologically in the latter half of the 20<sup>th</sup> century. Driven by advances in science and technology, the pace of change will continue to accelerate in the years to come.

Advances in technology and productivity improvements have expanded the capacity to produce agricultural commodities faster than the growth in demand, thus producing commodity surpluses, and resulting in a sustained, long-term, real decline in most agricultural commodity prices.

Agricultural policies of some countries have also contributed to low prices. Increased international competition has contributed to this phenomenon as well, particularly in recent years, and will continue to push prices down, regardless of the level of government support. For example, in several major commodities, such as oilseeds, low-cost countries are expanding production and capturing global market share with low levels of government support.

While the sector has successfully expanded value-added processing of food products, leading to a doubling of the value of Canadian agri-food exports from \$10 billion to over \$25 billion over the past fifteen years, the long-term growth potential for value-added food products is not expected to be sufficient to sustain the sector in the future.

Accelerating advances in science and technology offer the potential not only to increase productivity, but also to develop new products, new uses and new markets for agricultural products. They also offer the potential to develop new production practices and processing techniques that address public expectations regarding food safety, quality, and environmentally responsible production.

Food safety has always been important to consumers, but recent high-profile events around the world, such as BSE and outbreaks of E. coli contamination, have raised consumer awareness and expectations. Domestic and global consumers are demanding increased assurance regarding the safety and quality of the food they eat.

In addition to food safety, consumers are increasingly knowledgeable and discerning in their food purchases and are demanding greater choice.



Agriculture's long-term prosperity also depends on its ability to co-exist sustainably with the natural environment. Canadian farmers recognize their responsibility as environmental stewards and are taking proactive measures in this regard.

Agriculture has undergone significant changes in recent years in response to evolving market demands, new production technologies, and a shift towards larger, more intensive operations.

While all of the effects of these changes on the environment are not fully understood, recent studies show that some key pressures arising from agriculture, such as nutrient surpluses and emissions of greenhouse gases, have been increasing.

At the same time, public awareness and concern about these issues are growing. Canadians expect all economic sectors, including agriculture, to do their part to protect the environment. In addition, rising global concerns surrounding climate change, pollution and resource depletion will place increased attention on the development of renewable resource-based economic activity.

The agriculture and agri-food sector will have substantial opportunities for sustainable profitability and growth based on new uses for agricultural products in the emerging sustainable economy.

## *Implications*

In assessing the implications of these challenges and opportunities it seems clear that the Canadian agriculture and agri-food sector can no longer rely only on low-cost commodity production for food and feed as a key competitive advantage. New sources of value and value-added will have to be explored to generate sustainable profitability and growth for the sector as a whole.

From a strategic perspective, this represents a shift from competitiveness based on low-cost commodity production towards competitiveness based on product differentiation through tailoring products and inputs to meet specific standards and market requirements.

Public expectations regarding food safety and quality and the impacts of agricultural production and processing on the environment are focusing increased attention not only on the intrinsic qualities and attributes of agriculture and food products themselves, but also on the manner in which they are produced and processed, and public demands for more and better information are increasing.

Science breakthroughs in genomics, proteomics, metabolomics and the emerging nanotechnology hold the potential to achieve advanced understanding of biological systems at the molecular level.

This, in turn, prepares the way for molecular design of customized food and non-food products from agriculture and the bioresource base to address health, safety, quality and environmental concerns of citizens and consumers.

But they bring with them new concerns about the responsible application of science and technology for the benefit of all Canadians.



## The Role of Government Science and Research

The 1999 report of the Council of Science and Technology Advisors (CSTA) broadly suggests that government-sponsored science should contribute to:

- The development, evaluation and commercialization of ideas that lead to new economic growth opportunities and enhanced quality of life for Canadians; and
- The development of knowledge and technology necessary for government to perform its functions effectively and efficiently, including regulations, policy development and standard setting.

## Agriculture and Agri-Food Canada Vision, Mission and Strategic Outcome Priorities

As a first step in addressing these challenges and opportunities, AAFC has defined a vision for Canadian agriculture and agri-food and aligned its mission statement to reflect this vision.

### AAFC Vision for Science

Our vision is of a Canadian agriculture and agri-food sector that is innovative and competitive, whose partners work in unison to be the world leader in the production of food and other agriculture-related products and services that meet global consumer needs in ways that respect the environment and contribute to the best quality of life for all Canadians.

### AAFC Mission in Science

Our mission is to provide information, research and technology, and policies and programs to achieve security of the food system, health of the environment, and innovation for growth.

### AAFC Strategic Outcome Priorities

AAFC has identified three strategic outcome priorities to align departmental actions, initiatives and activities with its vision and mission: Security of the Food System; Health of the Environment; and Innovation for Growth.

#### *a) Security of the Food System*

The ultimate goal is to make Canada the world leader in reliably producing, processing and distributing safe, high-quality food to meet the needs and preferences of consumers.

#### *b) Health of the Environment*

The ultimate goal is to make Canada the world leader in using agri-environmental resources in a manner that ensures their quality and availability for present and future generations.

#### *c) Innovation for Growth*

The ultimate goal is to foster innovation in order to make Canada the world leader in developing food and other agricultural-related products and services that capture diversified opportunities in domestic and global markets.





## The Role of Science and Innovation

From a science and research perspective, discovery science is the foundation of innovation. It extends from the development of the original hypothesis of how something new could be done, to proof of concept research, followed by examination of possible applications and the development of new technology based on this new knowledge.

Subsequent pre-commercialization work helps to transfer this new technology to potential developers and businesses by piloting the technology or product and then scaling up these pilots to commercial scale to demonstrate the feasibility and market potential.

This process from original idea to demonstrated commercial potential can be called the *innovation chain*.

Its application is broader than science and research and includes management and administration methods and practices, production process layout, distribution and handling methods and practices, and even market development and marketing practices.

The further you go from the original discovery science, which is often largely a public good, towards the demonstration of commercial potential, the greater the potential benefit to the private sector. The challenge for AAFC is to seek an appropriate balance between public and private investment along this innovation continuum.

As we move along the innovation chain, advances in science and technology are creating increased opportunities to break traditional commodity products down into constituent components. Commercialization of these constituent components requires three key pre-commercialization steps:

(1) evaluation of the technical and economic feasibility of extracting the components,

(2) evaluation of the economic feasibility of marketing these components for particular applications, and

(3) development and piloting of processing technology and techniques to demonstrate commercial feasibility of producing and marketing these components.

These three steps are needed just to get to the point where venture capitalists could assess the risk of supporting further development and commercialization.

These pre-commercialization activities between the research bench and the point of commercialization will require increased attention as we move to capture benefits from the bio-economy.

This will require a rethinking of the role of government in this area and may require a shift in government science policy direction.

At a minimum, accelerated commercialization of scientific knowledge in these areas will require a focused, collaborative, cross-functional, multidisciplinary approach vastly different from our traditional approach to research and development.

From a science and research perspective, pursuit of agri-based new products, new processes and new market opportunities in the emerging bioeconomy requires ongoing development and maintenance of scientific expertise.

Breakthroughs in biological sciences and information technology are pushing the frontiers of science and research. AAFC science must keep up to maintain its relevance and help to ensure that government can continue to deliver its mandate and provide relevant public-good research.

This has implications for the development of AAFC strategies for the attraction and retention of qualified scientists and technical staff, as well as strategies for investment in the necessary state-of-the-art infrastructure and equipment.



The multidisciplinary nature of many of the challenges and opportunities facing the sector and the government suggests that AAFC will have to pursue a partnership strategy to develop and maintain critical masses of expertise to staff and develop multidisciplinary clusters of researchers.

Partnerships can be an effective way to pursue the development of an integrated national science and research capacity in a way that helps to optimize the benefits of investments in increasingly expensive and complex state-of-the-art facilities and equipment.

From a science and research perspective, the shift towards a product differentiation strategy to achieve sustainable profitability and growth in the sector implies increased involvement of scientific expertise in the market development and sales process.

Market intelligence collection will need scientific involvement to track the scientific and technical progress of competitors, as well as provide information that can strategically target Canada's science and research efforts to support Canadian competitive advantage.

Producing goods through customized production or manufacturing processes moves into the area of technical sales. This will require greater involvement of scientific experts to help potential customers fully understand and capture the benefits and potential of new products, processes and technologies.



## AAFC Mission Critical Areas for Science and Research Action

In considering its role as a government department, the identified strategic outcome priorities for AAFC, and the challenges and opportunities facing the agriculture and agri-food sector, the government and Canadians, AAFC has identified eight (8) Mission Critical Areas (MCAs) for its science and research efforts.

Our consultation process will focus on obtaining stakeholder advice and feedback on the regional and national research priorities that should be undertaken within each of these MCAs.

### 1. Research on bioresources

*enhance the ability to respond quickly and effectively to biosecurity, environmental, and health and food safety risks as well as economic opportunities through bioresource information systems and authoritative knowledge of bioresources*

### 2. Research on crop production and health

*prevent catastrophic losses in agriculture from weeds, diseases, pests and climate change through risk management strategies including enhanced germplasm, beneficial management practices and integrated pest management*

### 3. Research on animal production and health

*enhance livestock health and welfare through innovative nutrition, stress management and disease control strategies for livestock production*

### 4. Research on environmentally sound crop production

*advance Canada's environmental agenda and the environmental performance of the Canadian agriculture and agri-food sector through innovative crop production strategies and systems*

### 5. Research on environmentally sound animal production

*advance Canada's environmental agenda and the environmental performance of the Canadian agriculture and agri-food sector through innovative animal production strategies and systems*

### 6. Research on food safety

*enhance food safety through detection, characterization and control of food borne hazards*

### 7. Research on food quality

*improve human nutrition and wellness through conservation of the composition and functional properties of food throughout the value chain*

### 8. Research on bio-agro processes and products

*capture market opportunities for the Canadian agriculture and agri-food system through development of innovative uses of biomass for bio-industry and food sectors and through innovative production and processing systems*