# Next Generation
## of Agriculture and Agri-Food Policy

## Innovation and Science under the Next Generation of Agriculture and Agri-Food Policy: A Discussion Paper

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**The Next Generation of Agriculture and Agri-Food Policy –**
**A Federal, Provincial, and Territorial Initiative**

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# Innovation and Science under the Next Generation of Agriculture and Agri-Food Policy: A Discussion Paper

## 1. Introduction

This paper is one of a series of consultation documents designed to stimulate a dialogue amongst all stakeholders about how governments and others can work together to ensure a competitive and profitable Canadian agriculture and agri-food sector that provides safe, innovative and high quality products and services.

There are five thematic papers, covering the topics of: innovation and science; environment; food safety and quality; renewal; and market development and trade. These five areas largely reflect the structure of the existing Agricultural Policy Framework and it is hoped that stakeholders will also provide input on whether a different set of themes would work better in the future.

Additional consultation material includes:

- An overarching discussion paper meant to stimulate dialogue on the broad issues facing the sector and the overall direction of the agriculture and agri-food sector;
- A principles paper meant to stimulate dialogue on guidelines for developing the next generation of agriculture and agri-food policy;
- Consultation material on business risk management (BRM) programming; and
- A series of economic backgrounders.

Thank you for taking the time to review this paper. We welcome your input and ideas. Contact information is provided at the end of the paper.

## 2. Background

The prosperity of the Canadian agricultural sector has long depended on technological advancement to adapt to changing agronomic conditions and domestic and international market demands. This focus on technical advancement has been rooted in achieving heightened productivity gains at the farm level.

Today's opportunities for growth are changing. Productivity growth in Canadian agriculture can no longer offset the combined impact of declining commodity prices and rising input costs. A number of Canada's competitors are better equipped to compete in the current environment which is threatening Canada's competitive advantage. For example:

- Low-cost, low-subsidy countries such as Brazil and Argentina are rapidly expanding production;
- Brazil has surpassed US production in oilseeds despite high US subsidies. Brazilian production costs are significantly lower than Canada's; and,
- China, India and Russia are rapidly increasing production.

Canadian agriculture should continue improving its sectoral productivity but for the sector to remain profitable, it will also need to focus attention on expanding its innovative capacity. It should develop new ways to generate wealth, cut input costs, add value and develop new competitive and comparative advantages. One approach is to distinguish our products and processes from our competitors in a way that generates benefits to producers. For example, the development of new crop varieties and other differentiated products have allowed producers to capture new market opportunities (e.g., organics, functional foods) as well as to respond to changing

agronomic conditions and lower their overall production costs.

The prosperity and competitiveness of the Canadian agri-industry also will depend on its ability to adjust to the changing global environment. Consumers around the world are demanding new and innovative products. There are non-food and non-feed market opportunities to be captured from the emerging bioeconomy in areas such as health, energy and industrial products.

The development of the next generation of agriculture and agri-food policy is an opportunity for governments and industry to further identify specific policies, develop responsive programs and create incentives to facilitate innovation.

Innovation is the cornerstone of economic growth, improved competitiveness and profitability. It drives growth in existing markets and encourages the development of new ones. As an example, more than half of current economic growth in the United States comes from industries that barely existed a decade ago. This is the power of innovation.

Innovation transforms knowledge so that it is made useful, accessible and profitable. However, the origin of innovation can come from different sources. In some cases, an innovative product or process can come from new knowledge that originated in the laboratory. In other cases, innovation is the result of adapting an existing technology in ways that bring new benefits to the marketplace.

Irrespective of how or where an innovation originates, the degree to which innovation occurs is, in large part, dependent on the balance achieved between competing and often interrelated factors such as: research and development (R&D) capacity; human capital; new business development skills; financial capital; an effective policy and regulatory environment; and access to markets.

## 3. Roles and Responsibilities

Generally speaking, the demands of consumers are the single most important voice in determining whether an innovative idea or technology is saleable in the marketplace. Accelerating the pace of innovation requires the support of both industry and governments. Nevertheless, it is industry, and more specifically entrepreneurs, that should have the primary responsibility for selecting and advancing new products and processes because they have the greatest incentive to innovate successfully.

This is not to say that governments would remove themselves from the process. Governments can create an environment supportive of innovation. They can assist the private sector in pursuit of commercialization by providing capital and financing to meet governments' objectives. In addition, given that early-stage innovation is often high-risk, governments can provide mechanisms to share or mitigate this risk and thereby encourage new investment and entrepreneurial activity.

## 4. Current Policy and Programs

Federal, provincial and territorial governments responded to the need to expand the innovative capacity of Canada's agriculture and agri-food sector by including it as a component of the Agricultural Policy Framework (APF). Under the APF, innovation was paired with science to form the Science and Innovation pillar.

The APF Science and Innovation pillar had three specific policy goals:

### A. Realign public science resources

- Realigning and increasing investments in priority areas, as well as in biomass, bio-products and bio-process research; and,
- Increasing the level of investment in innovation from non-agricultural sources.

### B. Co-ordinate along the whole value chain

- Expanding and strengthening linkages between the sector, science and the innovation community, both within Canada and internationally; and,
- Improving technology transfer, co-ordination, communication and collaboration across markets, policy and scientific disciplines, research organizations and throughout the entire value chain.

### C. Create an innovation climate

- Accelerating the development and adoption of innovations while maintaining an effective science-based and transparent regulatory system;
- Ensuring the human resources and infrastructure needed for science and innovation are available in Canada;
- Fostering a supportive climate for investment, technology transfer and commercialization; and,
- Better utilization of intellectual property from publicly supported research.

The Science and Innovation pillar entails two initiatives: a Broker Program and an Agri-Innovation Program.

The Broker Program brings together people and organizations with a mutual interest in developing new business strategies and market opportunities. Groups formed through this program build links and identify opportunities to accelerate innovation in areas of commercial and scientific promise for Canada. This results in new market opportunities for higher value, agri-based products and processes.

The Agri-Innovation Program provides financial support to advance opportunities created through the Broker Program. The program provides funding assistance towards: identifying key agri-innovation opportunities; undertaking applied scientific and pilot processing activities; and accelerating the development of new and emerging innovations that offer promise in the marketplace.

In addition, funding has been provided to support efforts to realign research priorities and initiatives. As part of APF funding for science and innovation, the provinces have directly funded a wide range of projects that address requirements identified by each province. To date, most of these projects have involved the development of R&D activities or expanded R&D capacity. These investments have been made in addition to other science and innovation funding through FPT bodies.

## 5. Considerations

Through the course of the APF, a number of lessons have been learned related to science and innovation. These lessons should be considered as we move forward with the next generation of agriculture and agri-food policy.

In pursuing the realignment of our science and research efforts to meet APF priorities, we learned that:

- In the absence of new money for new priorities, progress in realignment is slow;
- Capturing new opportunities in the bioeconomy is critically dependent on the development and transfer of new scientific and technical knowledge;
- No one organization has all of the necessary resources to address complex, multidisciplinary issues; and,
- New knowledge development requires:
  - New investment;
  - New skills, state-of-the-art facilities and equipment;
  - New funding mechanisms that support partnerships; and,
  - New science and research collaboration mechanisms.

We also have learned lessons while working with entrepreneurs to develop innovative and novel products. These include:

- Successful innovation is knowledge-driven and market-oriented;
- There is a lack of pre-commercialization support mechanisms to advance innovations through to commercialization;
- Canadian agriculture needs more industry leaders to champion new market opportunities;
- Approaches to agri-industry innovation vary across Canada;
- The lack of a clear regulatory system is a significant barrier to investment and the introduction of new innovations;
- Value chain strategies help to capture new market opportunities; and,
- The time required to obtain program approval can be lengthy, which can affect the ability to respond to innovative opportunities in a timely manner.

As we move forward with the development of the next generation of innovation and science policy, it will be important to apply these lessons in order to:

- Stimulate investment in innovation to capture new market opportunities;
- Address structural impediments in areas such as regulation and intellectual property;
- Identify and respond to emerging innovations in a timely and proactive manner; and,
- Focus more systemically on the bioeconomy.

## 6. Proposed Objectives and Policy Options

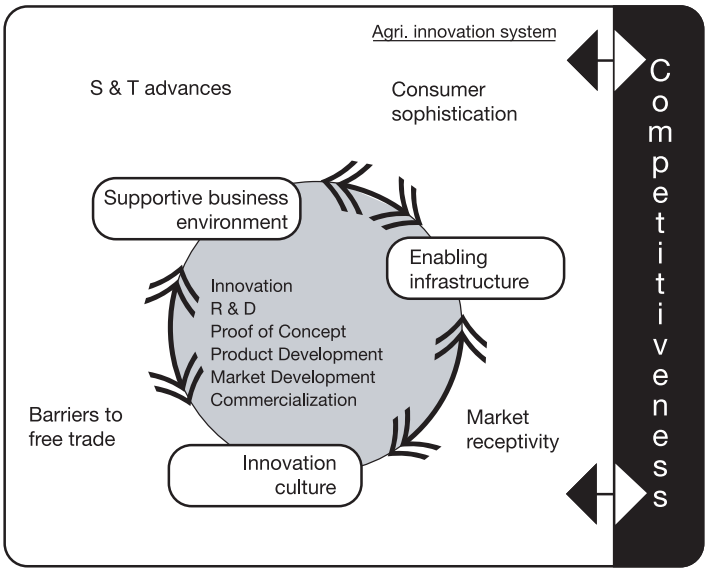
For innovation to succeed there must be a supportive innovation environment. This supportive environment can be defined as having three distinct characteristics:

A) A supportive business environment;

B) Enabling infrastructure; and

C) An innovation culture.

These three characteristics are interrelated and must work together.




The next generation of agriculture and agri-food policy offers an excellent opportunity to strengthen the innovation environment. The following sections expand on the current environment and offer ideas for improvement in the three areas outlined above.

## A. A Supportive Business Environment

A supportive business environment is transparent and forward looking. It reduces business risk and encourages firms to invest in R&D and innovation. A supportive business climate addresses the needs of both businesses and consumers. With respect to the Canadian agriculture and agri-food sector, improvements may be possible in the following areas:

- The regulatory system;
- The intellectual property regime; and
- Access to capital.

### The Regulatory System

The regulatory system is a critical component to support social, economic and environmental goals. In fact, Canada's regulatory system reflects the importance that we place on ensuring that the health and safety of Canadians are not jeopardized. Our regulatory environment is also an important factor in industry's ability to respond to increasingly sophisticated consumer demands and rapid technological change. The quintessential question for governments and society generally is how to effectively safeguard the public while enabling innovation. It is clear that how a government regulates determines the incentives and constraints that directly affect the behaviour of firms and may affect the overall success and profitability of a sector.

Although Canada has a sound regulatory system in place, stakeholders have expressed concerns that the current regulatory framework lacks responsiveness and transparency which hampers industry's ability to be innovative, remain competitive and to continue to attract investment.

Improving the overall effectiveness of our regulatory system will mean taking proactive steps to demystify the regulatory process. One long held criticism of our existing system is the lack of clarity and certainty with respect to regulatory requirements. The inconsistent application of those requirements in terms of the timelines and standards needed to complete the approval process has been identified as a reason why innovators either do not pursue commercialization or move their operations to other jurisdictions.

Science is becoming more widely available in terms of sharing scientific results and knowledge. Our regulatory system often re-creates scientific evidence domestically which extends the length and complexity of approval processes. This has been highlighted in such areas as pesticide registration and health claims where supporting scientific testing has already been submitted and approved internationally. Finding ways to improve our scientific capacity and use proven scientific knowledge and testing from other jurisdictions could help to improve the responsiveness of our existing regulatory framework.

In many instances, a clear regulatory pathway has not been identified for emerging technologies. Building the foresight capacity within government and industry could also provide the regulatory system with knowledge regarding advances in sciences and changing market demands. In addition, building a dynamic review process within the regulatory system may assist in ensuring we retain the highest levels of safety while simultaneously ensuring regulations are responsive and to attract investment and stimulate technology development.

In some cases, a new innovation can generate significant debate and discussion as to the social and economic impacts it creates. Given that our regulatory system is science-based, it is not adequately equipped to address these types of issues. For the overall and long-term competitiveness of the agri-innovation system it may be important to actively explore ways to address the social and economic impacts of innovation both within and outside our existing regulatory system.

### Intellectual Property

Canada's intellectual property regime has come under scrutiny in recent years due to concerns that the current patenting regime is causing Canada to lag behind its main competitors. An uncompetitive intellectual property regime may

discourage both domestic and foreign investment and commercialization and, therefore, hamper both the import and export potential of a country, particularly in the area of higher-risk technologies. To improve prospects for private investment, some parts of the sector may require that intellectual property provisions be brought in line with those of Canada's competitors.

Among industrialized nations, Canada relies heavily on foreign R&D, but there is heightened global competition for R&D funds (e.g., international agricultural biotechnology companies). Improvements to Canada's intellectual property regime would help to maintain and potentially increase our current level of R&D foreign investment.

For others, there is a risk that innovative capacity will be constrained by having knowledge locked up through copyrights and patents. An overly-protective intellectual property regime could inhibit competition, innovation, and the diffusion of knowledge and technology. For example, having to obtain licenses or exceptions from multiple patent holders (e.g., upwards of 70 patents apply to "golden" rice) could prove to be a serious barrier to further R&D.

Other "fast mover" methods of protecting innovations need to be recognized and evaluated, such as confidentiality agreements/trade secrets and lead-time advantage on competitors. In addition, there is currently a lack of a consistent approach to the management of intellectual property across public sector research organizations and jurisdictions which can serve to impede innovation. This situation is particularly complex among universities and other public sector institutions where intellectual property policies are often negotiated by the administration and their faculties. These differences often lead to difficult negotiations and result in cumbersome administrative processes for establishing multi-institutional research and development networks.

While the intellectual property regime is not specific to the agricultural sector, there may be an opportunity to focus on key areas that have significant impacts on agricultural innovation and science, such as publicly-funded agri-food research.

### Access to Capital

Many in the sector have expressed concern that the limited availability of capital restricts the growth of new and established farms and other agri-enterprises. In addition to replacing aging equipment and machinery, farms and other agri-businesses must make large investments to obtain economies of scale, to diversify, to innovate and to capture market opportunities. Innovation associated with the bioeconomy often involves extensive and costly R&D and a lengthy regulatory process to assess health or environmental considerations. This translates into the need for substantial and patient capital.

Farms and agri-businesses are generally well served by existing private, public and other suppliers of capital. However, small agri-businesses lack awareness of sources of capital. Similarly, institutional suppliers of equity capital lack familiarity with the agriculture and agri-food sector and are therefore less likely to provide investment.

The ability to develop detailed and compelling business and financial plans is critical in obtaining the necessary investment to move a good idea through to the marketplace. Some would argue that the sector is currently lacking the business and financial planning needed to demonstrate to investors potential economic returns. This is further exacerbated by the difficulties associated with obtaining financing quickly enough to truly support transformation within the sector.

### Summary of Actions - Improving the Business Environment

The following list summarizes actions that could be taken to bolster the business environment and enhance our innovative competitiveness.

- Ensure an effective science-based regulatory regime by addressing key issues (e.g., timeliness, transparency, standards development/measurement, dynamic regulatory review mechanisms, enhancing government scientific capacity, a regulatory system that is informed by scientific approvals in other jurisdictions)
- Industry/government foresight working group to assist regulators
- Consistent management of IP across public research organizations
- Develop tools for a competitive IP environment
- Explore further opportunities to facilitate investment capital
- Dedicated networking forum for agri-businesses and investors

## B. Enabling Infrastructure

Enabling infrastructure refers to the underlying foundation required to support innovation. This foundation includes:

- A strong R&D capacity;
- Pre-commercialization support;
- Value chains; and
- Market access.

### R&D Capacity

R&D has the potential to improve the financial future for producers in Canada. A number of prominent studies have indicated that publicly-funded agricultural research is the most effective form of government support for producers in the long run.

R&D is an important driver of innovation and is the place where many innovative ideas are first developed and assessed. Canada has a solid reputation in terms of government spending on R&D, but private sector R&D tends to be low. As a result, we rank only 13th among OECD countries in total national expenditures on R&D. Canada's food-processing industry is a good example of this dynamic. Canadian food processors invest only a small proportion of their revenues back into R&D. One of the main challenges ahead will be to raise industry's level of R&D investment.

Enhanced coordination of science and research efforts also is required. No comprehensive mechanism currently exists for coordination and communication among national science and innovation decision makers. This limits our national ability to build capacity (people and infrastructure) and ensure that our efforts directly support national priorities. In recognition of the importance that science and research play in innovation, Agriculture and Agri-Food Canada recently announced a Science & Innovation strategy to address existing and future government and sectoral priorities and challenges. The strategy outlines a series of management goals to address excellence in science and science management as well as research objectives that focus on government and sector priorities.

Coordination and partnership development is not only important domestically but also internationally. International partnerships that are designed to access ideas from elsewhere, can help to improve our scientific and technical knowledge. This is particularly important for a country like Canada, which generates a very small proportion of the new ideas created worldwide. By expanding our ability to capture innovative ideas for new products and processes from other countries we can improve our ability to identify and seize the market opportunities that scientific and technological innovations present.

According to the 2005-2006 Global Competitiveness Report, Canada ranked 27th in propensity to compete based on unique products and processes. Canada needs to expand its ability to capture innovative ideas for new products and processes from other jurisdictions.

Ensuring that producers benefit from innovation is another critical issue with respect to R&D. One option would be for producers, collectively, to become investors in research and development initiatives through innovation levies (a check-off). A levy is an amount of money paid by producers to a provincial or territorial commodity board or national agency to support activities undertaken on behalf of producers. Levies have traditionally supported market development and promotion. More recently and more selectively, they have been invested in science-based research. Producer-investors can benefit from pooled resources and the ability to direct research efforts to develop creative solutions to priority issues.

### Pre-commercialization

It has been argued that Canada's ability to commercialize new and innovative products and processes is sub-optimal. There are currently gaps in terms of the level of attention and funding support devoted to ensuring that the pre-commercialization stage is able to effectively move potential innovations beyond the idea stage to the point where the private sector is willing to commercialize the innovation in the marketplace. Governments have made major investments in funding high-risk, long-term R&D to develop new technologies but have committed significantly less to supporting pre-commercialization activities.

Private sector investors, (i.e., angel investors, venture capitalists, commercial lenders, stock owners) must pursue a return on investment based on the profits of the companies in which they invest. Private-sector profits result from successful businesses with market-driven products and robust markets, and not just sound technology. The consequence, especially in the case of the agri-industry, is that private investors are cautious about investing in un-proven businesses, further compounding the lack of available pre-commercialization funding. Targeted investments may need to be considered to assist entrepreneurs in overcoming this pre-commercialization gap. This may also encourage more private investment at the commercialization stage as it would mitigate some of the initial risk.

### Value Chains

Innovations are often the result of complex interactions between various actors from different sectors of the economy. New value chains and other types of relationships need to be forged if investments are to occur in areas outside traditional agricultural activities such as the bioenergy, health and wellness and bioproducts. For example, cooperation between primary producers and energy companies is required to develop bio-fuels. Similarly, cooperation between primary producers, processors, chemical companies and manufacturers is required to develop bioproducts.

However, there are many examples of successful collaborations that are already working within the agriculture and agri-food sector. Many firms in the food-processing industry collaborate effectively with food ingredient, equipment and packaging suppliers to develop new products and processes. Industrial clusters can also facilitate the attraction of investment capital, contribute to a better understanding of markets, and assist firms' ability to exploit innovative ideas commercially. Nevertheless, more could be done to strengthen and expand these types of strategic alliances in other non-traditional agricultural enterprise.

### Market Access

Canada has a relatively small, open economy. We will find it increasingly difficult to sustain globally-competitive firms while meeting domestic needs for investment in technology and other productivity drivers unless we become globally engaged. The agriculture and agri-food sector requires continued access to foreign markets as well as quality foreign investments and international innovation partnerships.

In a world of global value chains, sophisticated market intelligence is crucial for business success, especially in the case of emerging markets. Improving our knowledge base about innovations occurring in other countries will enable the sector to identify, respond and, ultimately, capitalize more quickly on market opportunities derived from new and existing innovations.

Success for the Canadian agriculture and agri-food sector will depend on its ability to export both traditional and innovative new products. Trade policy will be key in this regard. Many Canadian-based innovations (such as some genetically-modified organisms) are still barred from foreign markets. We need to continue to work with our trading partners to eliminate some of the barriers facing these new products and processes. This includes working with our international partners toward the development of a globally acceptable position on adventitious presence (AP), which can be understood as the unintended presence of genetically engineered material in a commodity intended for food, feed, or other industrial applications. The lack of international compromise on AP has been identified as one of the major issues affecting further innovations in the agriculture and agri-food sector.

### Summary of Actions - Enabling Infrastructure

The following list summarizes actions that could be taken to support an enabling infrastructure for innovation.

- Develop and implement new mechanisms to optimize national science capacity and to address government and sector priorities
- Pursue opportunities to access and commercialize technologies from other countries through science and research partnerships
- Explore opportunities for check-off programs to increase benefits to producers from innovation
- Work with trade partners to improve market access for innovations, including developing a globally-acceptable position on adventitious presence
- Explore opportunities for targeted investments with a focus on the development of pre-commercialization support
- Facilitate the development of new value chains and support clusters focused on innovative synergies across cross-cutting industries
- Strengthen mechanisms that mak market intelligence available to investors and agri-businesses

## C. An Innovation Culture

Positive attitudes and perceptions regarding agriculture's innovative capacity, both from within and outside the sector, are necessary for future success. Measures may be required in the following areas:

- Improved sector confidence and entrepreneurial spirit;
- Enhanced skills sets to meet new and emerging market realities;
- Investor confidence; and,
- Public acceptance.

### Sector Confidence and Entrepreneurial Spirit

A culture of innovation that transcends sectoral institutions and organizations will be the foundation for moving forward with the next generation agriculture policy. However, the Canadian agriculture sector has been, by and large, cautious in looking beyond existing commodity value chains. Many of the impediments to innovation are rooted in this preference for improving existing products within established food markets rather than developing new markets (i.e., non-food/non-feed markets). Transcending the traditional cultural underpinnings of the sector will mean viewing the role of agriculture beyond providing safe, high quality and nutritional food. The sector has the potential to become a "solution provider" to broader social and societal objectives such health and wellness and environmental sustainability.

A sense of confidence and optimism is required to encourage those within and outside the sector to take risks and push the envelope. An entrepreneurial climate should be fostered, whereby those within the agriculture and agri-food sector are comfortable launching new ventures into uncharted waters. Conversely, a lack of confidence and entrepreneurial spirit will result in stagnation, with the sector failing to move beyond the status quo. A challenge in moving forward with the next generation of agriculture and agri-food policy will be to find ways to better recognize, develop and reward entrepreneurship.

### Skills and Knowledge Development

As with other sectors of the economy, there is a shortage of skilled entrepreneurs capable of transforming new ideas into products and services that customers want. There may be a need to ensure that the sector has the right mix of skilled professionals to be able to identify, respond and capture market opportunities that are derived from innovation. For example, from a food industry perspective, the demand for food scientists is currently exceeding supply. Identifying skills gaps such as these will ensure that the sector is able to fully capitalize on new ideas and innovations.

While identifying the skills gaps within the sector is important, it is also important to know how to fill those gaps once they have been identified. In some cases, training new people will be required but in other circumstances it will be a matter of determining how best to attract people with a particular skill set to the agriculture and agri-food industry. Attracting highly qualified professionals in a wide array of disciplines (e.g., scientists, entrepreneurs, business analysts, marketing specialists) will require taking a more proactive approach in promoting the sector as vibrant and forward-looking.

### Investor Confidence

Generating confidence and optimism among investors outside of the sector is critical to attracting new financial and capital investment. Investors need to be assured of the strength of the sector and of the potential for gaining a solid return on their investment. Typically, new and innovative agri-businesses in Canada have had a difficult time attracting investments, largely as a result of the level of risk investors perceive to exist within the industry.

Investor confidence will become even more important as the sector works towards developing strong and lasting partnerships with other sectors (e.g., automotive and energy sectors) that will be needed to take advantage of opportunities that the bioeconomy has to offer. Demonstrating that the agriculture and agri-food industry is not

only willing but able to proactively seize market opportunities will be critical to leveraging investments in agri-innovation.

### Public Acceptance

Public appreciation for and acceptance of innovations in agriculture is critical to building Canada's capacity to seize emerging market opportunities for agricultural products in non-traditional areas. Without public acceptance, there will be little market uptake.

Society's willingness to accept innovations varies. Some innovations have been readily accepted (e.g., cell phones) while others have met with some resistance (e.g., microwaves). Where benefits can be shown to clearly outweigh risks, innovative products and processes are more likely to be accepted. Providing opportunities for the public to participate in the regulatory process (even as observers) could potentially enhance public acceptance of new agricultural products. It may be necessary to place a higher priority on ongoing public dialogue concerning the benefits and risks of new and emerging technologies and innovations.

### Summary of Actions - An Innovation Culture

The following actions could be taken to support a strong, innovative, and entrepreneurial culture in the agriculture sector.

- Recognize, develop and reward entrepreneurship
- Reorient the sector as a solution-provider to societal challenges
- Identify and develop necessary and beneficial skill sets
- Develop an ongoing dialogue on risks and benefits of new agricultural technologies
- Work with educational institutions and/or develop programs to ensure skills sets strengthen the sector's innovation capacity

## 7. The Bioeconomy: Developing the Capacity to Meet Emerging Markets

In recent years, both the agri-food sector and consumers have begun to look at food not only for the basic nutrition it provides, but for its health benefits. Consumers increasingly appreciate the link between diet and disease, an aging population, rising health-care costs, and advances in food technology and nutrition research. Diseases such as diabetes, heart disease and some cancers can be directly linked to lifestyle and food consumption. With improved food products and improved choices made by consumers, millions of dollars could be safely diverted from health care to other needs.

To take advantage of these new markets, new partnerships will be required that focus on functional foods, nutraceuticals, healthy diets and disease prevention. Removing regulatory impediments to the promotion of the health benefits of such products would encourage the development of a wider array of innovative, health-oriented products.

The emerging bio-economy, driven by advances in biotechnology and the biosciences, may be comparable in scope to the "digital economy". Industrial bio-refineries, ideally located in rural areas, have been identified as the most promising route to a new bio-based economy. Bioproducts are poised to challenge petroleum-based products as the basis of the economy in the twenty-first century. In particular, the production and use of bioproducts offers many potential benefits:

- Effective use of under-utilized capacity in agriculture;
- Increased wealth and job creation;
- Renewable alternatives to manufacturing, industrial and household chemicals; and,
- The revitalization of rural economies through the production and processing of renewable resources using biorefineries located in smaller communities.

Biofuel production is one possible route to economic diversification for the grains and oilseeds sector. The production of biofuels also contributes to the attainment of climate change and air quality objectives. Governments in Canada, at both the federal and provincial levels, have implemented measures to increase biofuel production and use. Current technology in biofuel production is dominated by the production of ethanol and biodiesel.

The potential benefits of the bioeconomy are significant. The challenge for the sector and for governments is to determine how best to capture these benefits.

### Summary of Actions - The Bioeconomy

The following is a list of actions that could be taken to advance the bioeconomy in Canada.

- Conduct national analyses on: availability and quality of Canadian biomass; the infrastructure requirements to process biomass; and the overall economic potential of the bioeconomy sector
- Address regulatory and IP barriers facing the bioeconomy sector
- Focus on the development of new and expanded value chains, linking agriculture to other sectors
- Examine the feasibility of different approaches to move bioproducts into the marketplace

## 8. Questions for Discussion

The development of the next generation of agriculture and agri-food policy is an opportunity for governments and industry to identify policies, programming and incentives to facilitate innovation. The priority and design of these initiatives requires significant discussion, and the following questions are intended to guide this discussion.

1. In general, how could an agri-innovation agenda focus on creating an infrastructure that supports innovation? How could this be accomplished?
2. Should an agri-innovation agenda also have a forward-looking focus on the bioeconomy?
3. Are the following principles for industry and government roles correct?
   - Industry and entrepreneurs should have the sole responsibility for selecting and advancing new products and processes.
   - Governments should focus on sharing or mitigating some of the risk associated with new agri-businesses to encourage increased investment and commercialization activity.
4. Are the initiatives under the following four themes the right ones? Are there others that could advance innovation?
5. Many areas for potential action have been identified below. It may be necessary to identify the two or three areas where initial activity should take place. Which of the ideas offered below is most important?

### Supportive Business Environment

- Ensure an effective science-based regulatory regime by addressing key issues (e.g., timeliness, transparency, standards development and measurement, dynamic regulatory review mechanisms, a regulatory system that is informed by scientific approvals in other jurisdictions)
- Create an industry-government foresight working group to assist regulators

- Consistent management of IP across public research organizations
- Develop tools for a competitive IP environment
- Explore further opportunities to facilitate investment capital
- Develop a dedicated networking forum for agri-businesses and investors

### Enabling Infrastructure

- Develop and implement new mechanisms to optimize national science capacity and to address government and sector priorities
- Pursue opportunities to access and commercialize technologies from other countries through science and research partnerships
- Explore opportunities of check-off programs to increase benefits to producers from innovation
- Work with trade partners to improve market access for innovations, including developing a globally-acceptable position on adventitious presence
- Focus on the development of pre-commercialization support mechanisms
- Facilitate the development of new value chains and support clusters focused on innovative synergies across cross-cutting industries
- Strengthen mechanisms that bring forward market intelligence available for investors and agri-businesses

### Innovation Culture

- Recognize, develop and reward entrepreneurship
- Reorient the sector as a solution-provider to societal challenges
- Identify and develop necessary and beneficial skill sets
- Develop an ongoing dialogue on risks and benefits of new agricultural technologies
- Work with educational institutions and/or develop programs to ensure skills sets strengthen the sector's innovation capacity

### Bioeconomy

- Conduct national analyses on: the availability and quality of Canadian biomass; the infrastructure requirements to process biomass; and the overall economic potential of the bioeconomy
- Address regulatory and IP barriers facing the bioeconomy
- Focus on the development of new and expanded value chains, linking agriculture to other sectors
- Examine the feasibility of different approaches to move bioproducts into the marketplace

## ADDING YOUR VOICE TO THE DISCUSSION

Federal, provincial and territorial governments look forward to hearing from a wide variety of individuals and organizations, and to working together to develop a solid policy framework that supports a prosperous agriculture and agri-food sector. We encourage you to add your voice to this discussion, beginning in January 2007. For more information on this process:

- Visit our website at http://www.agr.gc.ca/nextgen
- Call 1 800 O-Canada (1 800 622-6232)
  TTY: 1 800 926-9105
- Contact any federal, provincial, or territorial agriculture office