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An Agricultural Research, Innovation and Development Policy
for the Future

Leading in Sustainability

2017

“We emphasize there are a number of significant challenges that must be met if stable supplies of safe, nutritious and affordable food are to be provided for the global population, that is expected to reach 8.5 billion by 2030; these challenges include climate change, urbanization, conflict and the limited availability of energy and natural resources, such as land and water, and their increased degradation.”

– G20 Agriculture Ministers’ Declaration 2017, January 22, 2017, Berlin.

Feeding a world population that will grow to 9 billion by the year 2050, against the backdrop of the intensifying pressures of climate change, food safety issues and other factors must be met with a strong scientific base.

Agricultural productivity enhancements rely on research and innovation to drive growth and build a more globally competitive and sustainable economy driven by new and alternative sources of clean energy and thereby reducing our reliance on fossil fuels.

Canada can play a leading role in meeting these challenges and opportunities by renewing and enhancing our efforts to produce world-class agricultural research across a variety of disciplines and facilitating continuous knowledge transfer over the next twenty years.

This requires a shared vision and commitment from all stakeholders along the agriculture and agri-food value chain including governments, producers, and industry.

Diverse stakeholders need to be recognized for the role they play to ensure our agriculture and agri-food sector is environmentally and economically sustainable, advances human health and supports rural development.

Our renewed efforts in agricultural research begin with a modern agricultural research, innovation and development policy focused on sustainability.

As a living document that will be reviewed annually, the following pillars will ensure that current and future recommendations for inclusion in this agricultural research policy meet the foundational principles:

- **Sets national goals:** An effective agricultural research strategy needs to set medium and long-term research priority areas that support innovation and improve productivity. There must also be a focus on environmental sustainability and the advancement of human health.
- **Makes our diversity work to our advantage:** Our agricultural sector has a diversity of stakeholders that play critical roles in guiding research. When establishing our priorities, we need to take these differences into consideration and examine the scope at a large scale. This includes academic researchers, governments, producers, consumers, industry and many more.
- **Recognizes Canada’s global responsibilities:** We must acknowledge Canada’s partnership role in international efforts to tackle future food security and climate change challenges by mobilizing science and strengthening international collaboration networks for the benefit of farming communities worldwide.
- **Transfers knowledge:** We need to recognize the importance of knowledge transfer to producers and industry and the dissemination of research to all stakeholders, including the public.
- **Promotes financial stability:** We need to acknowledge the necessity for stable, predictable financial support for both fundamental and applied research.

Within the framework of these pillars, this national research policy (2017) addresses four policy areas:

- A. Building Capacity for Agricultural Innovation**
- B. Strengthening Cross-sectoral Collaboration**
- C. Setting a Strategic Innovation Agenda for Growth**
- D. Accelerating Market Adoption of Research Innovations**



SECTION ONE

Building Capacity for Agricultural Innovation

CORE INVESTMENTS

1.1. Ensure longer-term, stable core investments in agricultural research and innovation.

INFRASTRUCTURE

1.2. Provide incentives to convert unused public research facilities into centres of agricultural research excellence.

1.3. Evaluate changes and upgrades to existing public research facilities to elevate Canada's research capacity.

HUMAN CAPITAL

1.4. Address Canada's highly-skilled labour shortages with a targeted plan to recruit and retain agricultural researchers and innovators.

1.5. Increase investments in human capital for the agriculture sector through education and training.



SECTION TWO

Strengthening Cross-sectoral Collaboration

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2.1. Give greater priority to collaborative research projects that meet medium and long-term objectives.

2.2. Continue to expand public investment in agricultural research clusters.

2.3. Support dissemination of 'best-practices' analysis in public-private partnerships.

2.4. Streamline administrative accountability processes.

AGRI-BUSINESSES

2.5. Further tax incentives for existing research and innovation agri-businesses.

2.6. Create incentives for private entrepreneurs willing to invest in agriculture.

2.7. Build and enhance networks with the private sector.

2.8. Ensure an increased focus on value-added technologies to bridge the gap between research and production.

PUBLIC TRUST

2.9. Engage non-funding stakeholders and the public to promote support for agricultural innovation.

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SECTION THREE

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3.5. Targeted tax incentives in agriculture R&D to advance Canadian leadership in clean technologies.

INTERNATIONAL COLLABORATION

3.6. Strengthen existing initiatives that promote international science and technology (S&T) cooperation.

3.7. Set supra-national research priorities to address global challenges.

3.8. Mobilize Canada's research excellence to fuel agricultural innovation.

FUNDAMENTAL SCIENCE

3.9. Ensure stable, long-term and predictable support for fundamental research.

3.10. Create opportunities for greater collaboration between pure and applied researchers.



SECTION FOUR

Accelerating Market Adoption of Research Innovations

DISSEMINATION

4.1. Create efficient and accessible mechanisms to disseminate research being conducted and research results.

4.2. Collect data and best practices on the adoption of agricultural innovation and technology developments.

4.3. Support alternative models of extension on knowledge transfer, information exchange and co-learning.

COMMERCIALIZATION

4.4. Establish the structures required to enable the exploitation of intellectual property resulting from agricultural research projects in a more strategic manner.

4.5. Create a modern regulatory environment to help Canadian innovators achieve a competitive advantage at the international level.



SECTION ONE

Building Capacity for Agricultural Innovation

High benefit-cost ratios for agricultural research – estimated to range from 10:1 to 20:1 – confirm that the productivity gains attributed to agricultural innovation are worth many times the costs. Despite this evidence, public spending needed to build capacity in this area has gradually decreased in Canada over the last decades, hampering the potential of the agricultural sector for contributing to higher employment and economic growth.

CORE INVESTMENTS

1.1. Ensure longer-term, stable core investments in agricultural research and innovation.

Stable funding over the long term, from a diverse range of sources including federal and provincial governments, industry, agri-businesses and producers, as well as co-funding from other research disciplines, is necessary to ensure the greatest success and return on investment for partners.

A combination of funding mechanisms – public, levy-based and private funding – can be tailored to suit the particular needs and characteristics of the Canadian agricultural innovation system, ensuring all types of research and commodity sectors gain access to research funding and incentives regardless of their size.

INFRASTRUCTURE

1.2. Provide incentives to convert unused public research facilities into centres of agricultural research excellence.

Canada's publicly-supported experimental farms and agricultural research centres have been at the forefront of scientific discovery. In recent years, some government-supported agricultural research stations have been closed and facilities either mothballed or sold.

Suitable incentives should be provided directly to stakeholders to retrofit and convert, where feasible, the unused spaces into specialized centres of agricultural research excellence.

INFRASTRUCTURE

1.3. Evaluate changes and upgrades to existing public research facilities to elevate Canada's research capacity.

Backed up by appropriate impact assessments, public investments should be geared towards changes and upgrades to existing public research facilities to elevate Canada's research capacity.

Proper on-farm infrastructure, including broadband access in rural areas and new agricultural transformative infrastructure, needs to be in place for producers to fully realize the opportunities derived from innovative agricultural R&D.

HUMAN CAPITAL

1.4. Address Canada's highly-skilled labour shortages with a targeted plan to recruit and retain agricultural researchers and innovators.

A significant growth in the demand for highly-skilled workers in the agriculture sector alongside critical succession planning due to the looming retirement of senior scientists in government and academic settings represent an increasing risk of shortages of highly qualified personnel in all stages of the innovation process.

Canada's agricultural innovation system is more than ever challenged by labour shortages. This requires an integrated action plan to increase the existing supply of agricultural researchers and innovators and to efficiently deploy human capital where it is needed the most.

A labour market study geared specifically by sector, both public and private, should be conducted to identify the extent of these human resource challenges over the next fifteen years and determine the development of a targeted action plan to attract and retain scientists, technicians, and research assistants.

1.5. Increase investments in human capital for the agriculture sector through education and training.

Increased investments in human capital for the agriculture sector through education and training, including, but not limited to grants, scholarships, and career counselling for youth interested in pursuing a career in agriculture, have the potential to address existing and future recruitment and retention challenges.

These provisions should include the promotion of academic opportunities to attract and integrate highly-skilled international graduate students and new Canadians to innovative fields in agriculture.

Business management training programs should also prepare agri-business owners for attracting, hiring and retaining skilled labour force that can effectively participate in the innovation economy.



SECTION TWO

Strengthening Cross-sectoral Collaboration

With key stakeholders appearing to either under-invest or decrease their expenditures in research, economic disincentives and uncertainty can lead to a gradual reduction of Canada's capacity to innovate. The private sector, for example, has not been incentivized to invest in agricultural research and innovation to the same level as they have in other industries.

COLLABORATIVE RESEARCH

2.1. Give greater priority to collaborative research projects that meet medium and long-term objectives.

From improved water and pest management to more efficient farm management through traceability technologies and information management systems, innovation on sustainable agricultural systems is becoming increasingly networked, multidisciplinary and problem-oriented.

Collaborative research has proven an effective means of bringing together experts from a variety of disciplines to help tackle the complex issues impacting Canada's agriculture sector. The ongoing development of biofuels and precision agriculture are just two examples of research areas in which a broad interdisciplinary and cross-sectoral approach have had a positive effect on building sustainable and competitive agri-food systems.

Interdisciplinary and cross-sectoral research should thus be given a higher priority if we are to meet medium and long-term agricultural research objectives. Efficient structures to foster greater and on-going collaboration among researchers and to strengthen multidisciplinary cooperation are also required to fuel innovation in this area.

Regulatory frameworks governing research collaboration between academia and federal research institutions should ensure the creation of an enabling environment that encourages cross-sectoral dialogue and expanded networks.

A strong program of interdisciplinary and cross-sectoral partnerships should also promote greater collaboration between pure and applied researchers and between researchers, farmers and industry.

**COLLABORATIVE
RESEARCH**

Governments must take on an enabling role in collaborative research initiatives, working alongside producer groups and technical experts, as well as continuing to encourage multi- and interdisciplinary research that is backed up by strong fundamental research.

While large interdisciplinary and cross-sectoral research projects are valuable, they frequently exclude young researchers hampering their career development. Other approaches, such as small-team projects, may bring relevant results for the sector regardless of their organization or partners, and therefore should be recognized to promote their integration into larger-scale research projects. Increased administrative burdens prevent small producer and commodity groups from accessing to high-impact research projects. Administrative processes need to be simplified for these organizations to participate in interdisciplinary and cross-sectoral partnerships collaborative research.

2.2. Continue to expand public investment in agricultural research clusters.

Research clusters, whether industry or business-led, bridge the gap between scientific research and the marketplace, allowing businesses, industry, academia and government agencies to work closely together on research projects with high potential for commercial success that benefit Canada’s economy as a whole.

By drawing on expertise from across sectors, agricultural research clusters open the way for breakthrough innovations that contribute to productivity improvements and increased efficiencies in the agriculture and agri-food system.

Within an overarching coordinating framework, existing industry research clusters should be further supported financially, and new business-led clusters should be established in emerging areas, such as value-added agriculture, to encourage the faster uptake of new technologies and knowledge.

2.3. Support dissemination of ‘best-practices’ analysis in public-private partnerships.

Public-private and public-private-producer partnerships are prevalent in agricultural research. While each partnership is unique, every partnership encounters similar challenges and has its own set of risks.

An analysis of best practices in public-private partnerships that is shared widely across the sector could help create greater efficiencies in existing collaborations, as well as encourage the development of new partnerships.

2.4. Streamline administrative accountability processes.

The need to ensure that maximum funding in a partnership is earmarked for the research must be balanced by respect for accountability to funding partners. Partners should work together to streamline reporting requirements that both meet the obligations, yet do not overburden the administration of the partnership.

Duplication and complexity of reporting reduce the resources devoted to conducting the actual research. Governments can lead the way with federal and provincial officials working together to standardize government reporting requirements, reducing the complexity of reports that may discourage partnerships from forming. Similarly, universities involved in partnerships should also take steps to streamline their reporting mechanisms.

AGRI-BUSINESSES

2.5. Further tax incentives for existing research and innovation agri-businesses

Business-led innovation is essential to extract value from science and technology. Nevertheless, Canada's business-led innovation performance has increasingly declined against that of key competitor countries such as Australia and United States.

Although incentives for firms to invest in R&D for all industrial sectors are widely available through existing federal tax credits, special policy provisions and better targeted fiscal credits for agri-businesses, farmers and producers are needed to promote technology development, transfer and adoption in the sector.

2.6. Create incentives for private entrepreneurs willing to invest in agriculture.

Agri-entrepreneurs also play a major role in supporting the development and deployment of innovations at the farm level. With targeted incentives, agricultural small and medium enterprises (SMEs) producing at a scale that requires capital and support services to grow could foster innovation as a key strategy for achieving greater returns.

The process of innovation should be incentivized for R&D business ventures in agriculture that demonstrate high returns on investment and provide a business plan with clear targets and indicators for the progress achieved. These incentives, ranging from seed and patient capital funds to increased risk tolerance and risk-sharing mechanisms, will encourage greater private sector investment and participation in the sector.

2.7. Build and enhance networks with the private sector.

While opening up promising opportunities for commodity groups and post-secondary institutions, strategic business alliances can help Canadian R&D achieve a competitive advantage at the international level, enabling the environment needed to maximize knowledge transfer strategies in collaborative research projects. Greater business engagement could also facilitate the sharing of multipurpose agricultural data between the private and public sectors.

2.8. Ensure an increased focus on value-added technologies to bridge the gap between research and production.

New emerging areas of research in the value-added agriculture and agri-food processing sector, similarly to biotechnology, offer new and attractive opportunities for science graduates, researchers, and agri-entrepreneurs. The increasing growth experienced in this area demands both financial and non-financial incentives to conduct and disseminate innovative research that anticipates the production needs of current and future markets.

State-of-art infrastructure, fiscal incentives for R&D, ongoing close monitoring and continued assessment for value-added businesses willing to innovate, a modern regulatory environment governing intellectual property agreements in collaborative research and increased funding for cross-commodity value-added R&D can translate new discoveries into marketable innovations that can be commercialized and adopted more widely in Canada and worldwide.

PUBLIC TRUST

2.8. Engage non-funding stakeholders and the public to promote support for agricultural innovation.

The diversity of agricultural stakeholders goes beyond governments, funders, academia, and producers. Today's consumers of Canadian agricultural commodities are more educated and demanding. Their views on human health, animal welfare and environmental sustainability will continue to impact the sector in ways that were not imaginable fifty years ago.

With social license increasingly overlying the advancement of agricultural innovation, efforts should be made to better inform and communicate with the public to encourage social engagement and acceptance of new knowledge and technologies.

Successful partnerships are mutually beneficial not only to funding partners, but also non-funding stakeholders such as local farmers, consumers and indigenous peoples. A national coordinating body should cultivate our social license by actively engaging non-funding stakeholders in identifying their concerns regarding agriculture and searching for the best ways to meet their needs and expectations, thereby promoting crucial support for public investment in agricultural research and innovation.

2.9 Implement a national, cross-sectoral strategy to build greater public trust in agricultural research and innovation.

Research findings and their benefits to consumers frequently face skepticism from the public because of a lack of knowledge and understanding on agriculture R&D. Agricultural policy should envision evidence-based strategies to engage consumers in an open and constructive dialogue based on co-learning that helps increase consumers' understanding of the latest scientific discoveries rather than merely informing the public about the importance of agricultural research as a whole.

Government support can also help farmers, scientists and knowledge brokers better communicate agricultural innovation success stories to consumers, thus increasing public support for agriculture while encouraging youth to pursue careers in research.

Good corporate citizenship can also play a role in maintaining the sector's social license by ensuring that emerging and solidly established Canadian agri-businesses demonstrate a strong commitment to socially and ethically responsible business practices.



SECTION THREE

Setting a Strategic Innovation Agenda for Growth

The challenge of increasing productivity and competitiveness while reducing environmental impact is common across all sectors of the Canadian economy, particularly in agri-food production.

Canada's agricultural sector has a major role to play in meeting today's global sustainability goals that call for an even more climate-smart agriculture, demanding continuous technological development in this area coupled with solid scientific foundation and stronger international networks.

GOVERNANCE

3.1. Create a national body to set agricultural research priorities and provide strategic direction.

The absence of a national body to advance the coordination of medium and long-term agricultural research has impacted the ability to set and monitor research priorities and strategies.

Some degree of coordination that brings together our diverse range of stakeholders and takes into account national, provincial, regional, and international objectives, is needed; and only a national body would have the capacity to get collective advice on research priority areas.

Creating a national body to coordinate agricultural research and innovation, with a mandate to set medium and long-term agricultural research priorities, will help us create a roadmap to meet our future food security and environmental challenges and become a global leader in sustainable agricultural production.

Common priority areas can ensure that funding is efficiently allocated while reducing the risk of duplication. At the same time, a stronger strategy to coordinate research initiatives would also provide a basis for monitoring and evaluation mechanisms by measuring research impacts and outcomes on the ground.

**ENVIRONMENTAL
STEWARDSHIP**

3.2. Include environmental sustainability in medium and long-term national research priority areas.

An effective, consistent and high-impact agricultural research agenda needs to set national and regional medium and long-term research priority areas, clear strategies and measurable targets for achieving environmental sustainability in the sector.

Provisions to support better coordination and interaction between federal and provincial agencies, ministries, departments and other public institutions dealing with agricultural R&D and environmental issues should also be taken into account.

3.3. Use carbon pricing as a driver of agricultural innovation.

Rather than an unavoidable challenge, carbon pricing could become a key driver of innovation in the sector. This requires collaboration between key players and provincial governments to decide how tax revenue can be reinvested in green innovations for the agriculture sector, thus making it more cost-effective to innovate.

Small farmers should also be provided with incentives - such as discounts or tax credits, strict regulations, and penalties on emissions – to help lower risks and encourage adoption of new technologies that work to achieve minimum carbon emissions.

New policy in other areas should also supplement carbon pricing regulations. Agricultural innovation should promote the development of a circular economy, embracing new sources of energy and offering incentives for biofuel production.

3.4. Build capacity for emerging areas of sustainable agriculture research that support carbon-neutral farming.

With an expected rise in the international demand for Canadian agri-food commodities, policy provisions should address the potential impact and adverse effects of productivity gains on the environment.

Additional research funding and support should be provided in areas that consider the environmental impact of improved productivity such as water management, biofuels, urban vertical farming, forecasting data, high-resolution modelling, data storage, and cost-benefit analysis of innovations.

3.5. Targeted tax incentives in agriculture R&D to advance Canadian leadership in clean technologies.

Innovative farmers and early-adopters who have been proactive on their own before the introduction of mandatory regulations should be recognized and rewarded with tax breaks, rebates or credits. Small farmers should be supported with incentives that help lower risks and encourage the uptake of new low carbon and energy efficient technologies.

Existing industry-led assurance schemes and environmental farm plans should acknowledge the value of adopting sustainable innovations on the ground.

**INTERNATIONAL
COLLABORATION**

3.6. Strengthen existing initiatives that promote international science and technology (S&T) cooperation.

Canada has a unique opportunity to provide an efficient, low-carbon source of agri-food products to the world, and there is considerable potential to take advantage of S&T spillovers that exist at the international level.

International scientific and technological cooperation policies, including mechanisms to finance research and share costs and expertise, must be improved can help mobilize science for the benefit of communities worldwide and tackle global development challenges through research partnerships.

3.7. Set supra-national research priorities to address global challenges.

National research priorities tackling regional or global challenges can be linked with foreign priorities by competition, cooperation or specialisation relationships. For example, international coordination in the face of climate change affecting agriculture worldwide can positively influence research funding. These supra-national priorities can also shape our national research priorities as in the European Union case.

Opportunities for collaboration with international organizations implementing science and technology programs for innovation and development must be identified. Stakeholders should share a commitment to mobilize science for the benefit of communities worldwide and to tackle global development challenges through research partnerships.

While governments are important players, binational or third-party organizations, rather than government programming may be better suited to managing long-term multinational research relationships.

3.8. Mobilize Canada’s research excellence to fuel agricultural innovation.

International technology transfer has a pivotal role to play in increasing productivity growth and addressing transnational issues, such as climate change, water scarcity, or other issues that require investment streams from beyond our country alone. Support for scientists and other stakeholders to participate actively in international exchanges could allow for the development of these areas of research internationally.

Cooperation between developed countries in the form of cross-border long-term research groups can provide further opportunities for researcher mobility and avoid duplications.

Increased knowledge mobility – a more active participation of researchers in international exchanges, conferences and meetings – can also leverage our scientific capacity through the creation of global innovation networks.

**FUNDAMENTAL
SCIENCE**

3.9. Ensure stable, long-term and predictable support for fundamental research.

Fundamental research is the fuel for innovation and commercial application. An increased focus on innovation policies supporting marketable technologies may, however, lead researchers to lean towards applied research, hampering the development of fundamental research projects.

An innovation agenda that promotes medium and long-term priorities and supports greater interdisciplinary and cross-sectoral research initiatives requires a balance between the funding of fundamental and applied research.

Concrete mechanisms to improve funding models for fundamental research – both at the federal and provincial levels – should be examined by stakeholders with an aim to produce predictable, stable, and long-term funding mechanisms for identified basic research priorities. This, however, should not be at the expense of the various existing matching funds and partnership-enhancing grants.

3.10. Create opportunities for greater collaboration between pure and applied researchers.

Along with increased investment in capacity-building for agricultural research, collaboration among researchers – in particular between pure and applied researchers – remains a key factor in realizing the full potential of our strong knowledge base.

Enhanced collaboration is crucial to addressing the challenge of how to effectively use the findings of basic research to advance innovation. Bridging the gap between pure research and in-field application requires science and industry stakeholders to engage in an open and constructive dialogue at an earlier stage of research projects.

Technology transfer processes should then be broadened to include fundamental research within the innovation continuum. For example, in Germany, Max Planck Society's technology transfer office mediates between fundamental science and industry. While scientists focus on developing world-class research, experts in business development identify projects that can potentially form the basis for new products and processes working alongside industry partners.

Canada's post-secondary institutions can lead the way. Universities, colleges and the private sector can work together to develop efficient structures that foster greater and on-going collaboration between fundamental and applied researchers.



SECTION FOUR

Accelerating Market Adoption of Research Innovations

Government support to producers has been mostly geared towards smoothing volatility and managing risk at the farm level rather than investing in variables affecting productivity growth such as the adoption of new technologies. Canada's agricultural research and innovation system must increase its ability to weave knowledge exchange and commercialization into the research process to maximize its impacts on society, helping Canada reach its full potential in productivity growth and innovation.

DISSEMINATION

4.1. Create efficient and accessible mechanisms to disseminate research being conducted and research results.

Canada must develop efficient ways to disseminate agricultural research that is being undertaken and research results. Currently, our sector is isolated, with different research being communicated to different audiences. For example, producer groups send information to their stakeholders, scientific journals publish their research for their networks to see and research conferences bring together people to share information. Opportunities for broader research partnerships are missed and the risks of duplication are high.

The key consideration in moving forward on policies that benefit research dissemination is to achieve greater collaboration among all key stakeholders involved in agricultural research and innovation at the local, provincial and national levels.

Improved communication schemes and broad dissemination strategies should target all potential research end-users, including consumers, farm community groups, farmers, farm associations and producers, funders and potential future partners, rural communities, research communities, extension agents, agrologists, health professionals, decision- and policy-makers, among others.

Flexible, evidence-based and current policy tools are thus necessary to support efficient dissemination pathways for agricultural innovation.

From the lab to the farm, key actors in the research value chain should be provided with training on research dissemination, knowledge transfer and translation (KTT), and public communication.

DISSEMINATION

Specialized staff – knowledge translators or research-based communications professionals – should also support scientists to help them carry out comprehensive communication plans throughout the research cycle. Timing requirements for research projects would contribute to meeting the challenge of getting new research peer-reviewed and into producers’ hands when it will be most effective and reflective of the market.

4.2. Collect data and best practices on the adoption of agricultural innovation and technology developments.

There is no clear path of progression from agricultural research to knowledge transfer to use of new technology. Until recently, agricultural extension programs helped transfer innovation knowledge directly to the producer.

Understanding why a technology is or is not being used is key to improving rates of adoption and return on research investment. Working with producers and industry, a systemic and ongoing collection of data on the adoption of agricultural innovation and technology should be undertaken by federal and provincial governments.

Return on investment (ROI) and media studies are needed to determine the real impact of agricultural research on the ground. These resources not only form value propositions for farmers to encourage adoption and investment in new technologies, but they can also help attract greater public and private funding for agricultural R&D projects.

A more coordinated approach to identify best practices on the adoption of agricultural innovation and technology should be developed with appropriate stakeholders.

Through the sharing of best practices, agricultural extension models, knowledge transfer strategies and commercialization policies can be improved to better serve the agricultural sector, promote the dissemination of research results, and accelerate adoption of innovation.

4.3. Support alternative models of extension on knowledge transfer, information exchange and co-learning.

Farmers and producers need opportunities to work alongside extension specialists and researchers to understand the impact of agricultural innovations on the ground, to be guided through the adoption process and to test the latest technologies in their day-to-day operations.

Modern models of agricultural extension and knowledge transfer based on information exchange, participation and co-learning, rather than a simple transfer of data, can directly benefit end-users of research and promote greater collaboration.

The inclusion of funding and subsidies for public extension and knowledge transfer activities into federal programming, the integration of knowledge transfer objectives into the mandates of key institutions – from academia, industry, to the provincial and local ministries of agriculture – and enhanced collaboration across the sector can enable the environment needed to accelerate the adoption of innovations on the ground.

The creation of user-friendly resources and knowledge hubs ranging from mobile-based interactive apps and forums to data collection and management tools can also help address implementation barriers.

DISSEMINATION

Targeted communication strategies, such as the sharing of success stories featuring early technology adopters to which producers can readily relate, also have the potential to demonstrate the benefits of adopting sustainable technologies, turning innovative farmers into influencers and advocates of agricultural research.

COMMERCIALIZATION

4.4. Establish the structures required to enable the exploitation of intellectual property resulting from agricultural research projects in a more strategic manner.

Intellectual property (IP) offers a revenue stream to reinvest into future research and may bring a greater and faster return on investment. Stronger IP agreements and partnerships can also help Canadian agricultural research achieve a competitive advantage at international level.

A comprehensive agricultural intellectual property strategy is needed to create an enabling environment for the commercialization of innovations, and to set roles for key stakeholders involved in the exploitation of IP resulting from agricultural research.

Agricultural stakeholders should also learn how to manage innovations with business potential and choose the most beneficial exploitation and dissemination strategies. Specialist staff able to identify and manage knowledge resources with business potential in early stage agricultural R&D projects is essential for achieving greater utilization of new technologies and knowledge.

Additionally, collaborative research projects need to incorporate funding for knowledge management from the outset including capacity-building measures for staffing, training and retention of IP experts.

4.5. Create a modern regulatory environment to help Canadian innovators achieve a competitive advantage at the international level.

A comprehensive agricultural intellectual property strategy is needed to enable the exploitation of marketable innovations resulting from agricultural research projects in a more strategic manner.

Agricultural stakeholders should learn how to manage new knowledge and technologies with strong market potential and choose the most beneficial exploitation and dissemination strategy. Additionally, cross-sectoral research projects need to incorporate funding for knowledge management from the outset including capacity-building measures for staffing, training and retention of intellectual property experts.

Reduced, yet effective regulatory requirements to get the products into the marketplace must also be put into place to allow for the profitability of investments, reduce barriers to entry to markets and increase competition. Creating science-based regulatory processes are key to support the availability and adoption of agricultural innovations on the ground.

Administrative Burden: Direct and indirect costs imposed on stakeholders and associated with complying with administrative procedures.

Agricultural Extension: Services and activities that include an educational component aimed at sharing research outputs and know-how knowledge in agronomic techniques with farmers to improve their production, income and quality of life, allowing them to capture a greater share of the value chain.

Agricultural Innovation: Implementation of a new or improved product, marketing method, or organizational method in business practices, workplace organization or external relations. Agricultural innovation encompasses science and technology (S&T), research and development (R&D) and the adoption of scientific research outputs such as new production techniques or improved farming practices (OECD).

Agricultural Research and Innovation Stakeholders: Farmers, ranchers and producers, federal and provincial governments (the public sector), agri-businesses and agri-entrepreneurs (the private sector), industry and professional groups, post-secondary education institutions (universities, colleges, CEGEPs and polytechnics), non-profits and international partners, extension providers and professional agrologists, the Canadian public and consumers.

Cross-sectoral Research: Research conducted in conjunction with the public and private sectors, academia and/or producer associations. Contribution of funding and/or resources (personnel and research infrastructure) from both public and private sources.

Dissemination: Active process to communicate research results to potential end-users by using targeted strategies and products to increase the likelihood of adoption.

Environmental Sustainability: Use of existing natural resources while maintaining its potential future benefit.

Intellectual Property Rights (IPR): Assignment of property rights through patents, copyrights and trademarks. These property rights allow the holder to exercise a monopoly on the use of the item for a specified period.

Interdisciplinary research: Type of collaborative research that combines expertise from two or more disciplines to solve complex issues whose solutions are beyond the scope of a single discipline or area of research.

Knowledge Transfer: Process of transferring research outputs from knowledge producers to knowledge end-users.

Research and Development (R&D): Term covering three activities: basic research, applied research, and experimental development.


Research End-Users: Farm community groups, farmers, farm associations and producers, funders and potential future partners, rural communities, research communities, consumers and linking agents.

Social License: Level of acceptance granted to an organization or sector from stakeholders, including the general public. Those who do not fulfil the conditions for the social license may be exposed to ongoing challenges from the public and the consumer.

Technology Transfer: Process of transforming technology innovations into products for wider use.



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