

National Research and Innovation Strategy

Canadian Potato Council

November 7, 2012

Updated November 14, 2016

Addendum:

**2016 Key Priority Areas for Research for the next
Agricultural Policy Framework 2018-2023**





Funded by Agriculture and Agri-Food Canada, the Agricultural Innovation Program (AIP) is a \$50 million initiative ending on March 31, 2013 designed to: accelerate the pace of innovation; facilitate the commercialization and adoption of innovative products, technologies, processes and/or services that will enhance economic growth, productivity and competitiveness of the Canadian agriculture, agri-food and agri-based products sector; and help the sector capture opportunities in domestic and global markets.

Agriculture and Agri-Food Canada (AAFC) is pleased to participate in the production of the National Potato Research and Innovation Strategy. AAFC is committed to working with industry partners. Opinions expressed in this document are those of the Recipient and not necessarily those of AAFC.



The Canadian Potato Council and the Canadian Horticultural Council are appreciative of the partial financial support provided by the Agriculture and Agri-Food Canada AIP for the development of the National Potato Research and Innovation Strategy.

Section 1: Introduction

Background

In the summer of 2012, the Canadian Potato Council of the Canadian Horticultural Council commissioned a national consultation to support the development of a national research and innovation strategy. The overall objective was: “To develop a national strategy for potatoes that will articulate the stakeholder priorities for research and innovation in the Canadian industry over the next ten year period and provide guidance on addressing these priorities through new and existing collaborations”¹. The development of this national research and innovation strategy required the full cooperation and participation of industry members – growers, grower organizations, processors, academics and public servants. The strategy required the development of an assessment of the current status of potato research and innovation, along with a vision and clear and comprehensive industry priorities. The Canadian Potato Council’s Research Working Group (RWG), through the efforts of a consultant conducted six provincial consultations, one electronic consultation, developed a comprehensive inventory of Canadian potato researchers and potato research capacity, facilitated the RWG working meetings that led to the development of the strategic framework and ultimately the research and innovation strategy.

During the summer of 2016, Research Working Group members consulted with potato growers and industry stakeholders in their respective provinces to review the key priority areas for the next Agricultural Policy Framework 2018-2023. As an outcome of these consultations, key priority areas for research were adopted by the Canadian Potato Council on November 14, 2016. The key priority areas can be found in the ADDENDUM to this document.

Consultation and Strategy Development Methodology

A comprehensive environmental analysis was conducted through a series of seven provincial stakeholders meetings, coordinated by the grower associations in the major potato producing provinces. Face-to-face meetings were conducted in British Columbia, Alberta, Manitoba, Ontario, Quebec, New Brunswick and Prince-Edward-Island. The objectives of these face-to-face meetings were to identify the priorities relevant for their member growers in the short, medium and long term and compile an inventory the existing research capacities in the province. A Consultation Guidelines document was developed and approved by the RWG and outlined the consultation approach. A two-page document was also produced, translated and circulated to participants so that they may prepare for the meeting. In addition to the face-to-face meeting, a secure, password access controlled electronic flipchart was also developed allowing those unable to attend the face to face meeting to provide input using the consultation questions and lines of inquiry. Over one hundred and twenty industry representatives participated in the face-to-face consultation and an additional eight through the electronic flipchart. A report was completed after each provincial stakeholder consultation and a compilation of the electronic flipchart was produced as a record of these engagement activities.

The consultation phase concluded with the production of two reports for consideration by the Research Working Group. The first report, entitled National Potato Research and Innovation Strategy: Summary of the National Consultations, provided an analysis of the major findings coming from the consultations. The key elements of these findings are presented in section 2 of this report. The second report entitled National Potato Research and Innovation Strategy: National Researcher Inventory, provides a comprehensive inventory of researchers and research capabilities throughout Canada.

Following the distribution of the summary of the national consultation, the Research Working Group met in Fredericton on September 7th 2012, to develop a high level strategy framework that would lay the foundation for

¹ Statement of Work, Appendix A.

the research and innovation strategy, in addition to discussing at length the mechanisms by which the strategy would be governed. The resulting document, the National Potato Research and Innovations Strategy Guidance Framework, provide the broad outline of the strategy presented in this report.

Section 2: Strategic Environmental Analysis

The development of a strategy rests in part on the analysis of an organization’s environment. The pan-Canadian industry consultations provided much of the relevant information required to complete a strategic environmental analysis for the National Potato Research and Innovation Strategy. During the course of these consultations participants discussed both the important trends affecting the industry and the underlying change drivers² that give rise to the trend.

Key Trends and Change Drivers

Important Trend	Underlying Change Driver
Declining Potato Consumption Patterns	<p>Two very important change drivers are contributing to this decline in potato consumption:</p> <ul style="list-style-type: none"> ⇒ Changing demographics and ethnicity of Canadian society – potatoes are becoming less of a daily staple for many Canadians. ⇒ Changing consumer demands due to lifestyle choices made on nutritional requirements and health preoccupations. Specifically, Canadians consumers want to: <ul style="list-style-type: none"> • <i>Eat healthier – potatoes are erroneously viewed as an “unhealthy” food choice;</i> • <i>Make tastier food choices, and consume more flavourful potatoes.</i> • <i>Purchase foods that are more convenient, easier and quicker to prepare.</i> • <i>Explore and experiment with new and different food choices.</i>
Increasing Regulatory Burden on the Industry	<ul style="list-style-type: none"> ⇒ Increasing concerns over food safety is driving for greater regulations and traceability. ⇒ Food producers and growers are facing increasing pressure for sustainable growing and farming practices. This inevitably increases the burden and related costs onto growers and processors.
Changing Growing Conditions and Changing Pest & Disease Profiles	<ul style="list-style-type: none"> ⇒ Climate change. There is growing evidence that climate change is causing weather and climate fluctuations ultimately impacting growing conditions as well as pest and disease profiles.
Increasing Potato Production Challenges	<p>Although the consultations revealed many production-related challenges, the principal ones include:</p> <ul style="list-style-type: none"> ⇒ Increases of the cost of production inputs. ⇒ Increasing pressures on water and irrigation (several regions experienced drought conditions in the summer of 2012). ⇒ Shortage of skilled labour.
Persistent Challenge of Knowledge Transfer	<ul style="list-style-type: none"> ⇒ Slow adoption of research to change practices at the farm level. There exists a persistent view that research provides poor return on the investment. Some industry stakeholders indicate that we have not sufficiently invested in extension and knowledge transfer.

² A change driver is an important force that is giving rise to change in the industry’s strategic environment

Desire for a Coherent National Approach to Research and Extension

⇒ Financial pressures require a unified approach to research and knowledge transfer.

Industry Strengths

The provincial stakeholder consultations revealed several important strengths that are common to all potato producing provinces and as such must be considered as national strengths. There are five noteworthy strengths:

- Canada has an extensive national potato production network that is well supported and led by provincial associations. The presence of such a network, motivated by a willingness to collaborate for the betterment of the industry is an important force that can position the network to take a greater role in coordinating a national research and innovation strategy. Provincial associations benefit from the active support and direct involvement of growers, processors, and researchers and as a result, the network can readily connect research priority to the farm gate.
- The presence of an entrepreneurial spirit across the industry, at all levels makes this an ideal context where innovative solutions to existing problems can take a firm hold. Stakeholders are ready to engage in new and different forms of collaboration and resource sharing to achieve a more prosperous and sustainable industry.
- The intersection of three important factors creates a unique environment for research: our Canadian climate, grower knowledge and expertise along with the availability of inputs and water make an ideal research context.
- Canadian potatoes are globally competitive from a quality and price standpoint. The proximity to large consumer markets and our infrastructure capacity for export positions Canada favourably.
- The existing and somewhat underleveraged research infrastructure provides ample opportunity – Canada possesses large number of assets available to conduct research in all potato producing provinces.

Industry Weaknesses

Four principal weaknesses were identified throughout the consultations and have been partly expressed in the previous section. Increasing costs, increasing regulatory burden are important vulnerabilities of the industry. In addition, the strength of the Canadian economy in relation to other developed nations is placing the Canadian dollar in a strong position on international markets and subsequently affecting our export volumes. A final weakness relates to the concentration and purchasing power of large retailers such as Walmart that applies further pressure on the prices growers can obtain.

Potato Research and Innovation Weaknesses

There are three principal weaknesses related to potato research and innovation.

Canadian potato research efforts are fragmented. Despite the best efforts of all parties involved, potato research remains fragmented for three principal reasons.

- This is a perception (and perhaps a reality) that national research programs are concentrated in one part of the country and as a result the national effort is unresponsive to local needs.
- Industry stakeholders believe that the existing research infrastructure is not being fully leveraged and deployed for the benefit of local, regional and ultimately national grower's interests.
- There is an absence of coherent national research priorities that meet both provincial and national needs.

As stakeholders see research capacity erode over time, many feel that the succession of researchers is in peril. Lack of trained and skilled scientists and extension specialists is a scenario that all industry members wish to avoid at all costs. Finally, the third weakness is related to research funding. Public funding of research has been on a steady decline for several years. Recently, the federal government has signaled clearly its desire to have industry directly contribute to research and consultations have demonstrated the industry's openness to the idea. However some important hurdles remain: The structure of government programs must be adapted to allow for the funding of long-term research.

Strategic Issues

Several issues were identified in the course of the provincial stakeholder consultation. Some of these issues are “strategic” by nature, in that the resulting plan must address these issues directly or indirectly. The first two issues were felt to be of significant importance. The five issues are:

- The potato industry will need to develop mechanisms to enable them to directly invest in research. Other North American jurisdictions have begun this process and could serve as an inspiration to the National Potato Research and Innovation Strategy.
- The national coordination of research will require the striking of a delicate balance in serving both national and regional interests. Everyone wants a piece of the research action! Significant efforts must be made to ensure that no industry stakeholder feel they have not benefitted from research.
- The need to create a “new model” for potato research, innovation, extension and transfer. The research and innovation strategy must specifically address the “transfer” problem: getting research results to be adopted and practiced by the industry.
- The need to coordinate research and research extension activities. The National Research and Innovation strategy will require energy, time and resource to coordinate and implement. This will not happen spontaneously. Industry members will have to take charge!
- The inventory of researchers and research capacity has shed light on the availability of physical and human research infrastructure. There is a clear opportunity to fully utilize and leverage existing research infrastructure throughout the country.

Section 3: Strategy - Guiding Elements

A Vision for the Industry...

The vision is for an industry that is economically profitable, environmentally sustainable, and socially responsible.

A Vision for Research and Innovation...

Consistent with the industry vision, potato research and innovation in Canada is characterised by a nationally coordinated, long-term program that leverages national and international research assets and recognizes the diverse nature of the entire potato production value chain. Research and innovation activities are focused on a broad-range of research priorities that reflect the industry’s needs. They are facilitated by effective extension programs and resources and supported by long-term funding coming from private and public sources.

Mission or Purpose of the Research and Innovation Strategy

The purpose of a National Research and Innovation strategy is to:

- Ensure that Research is **COORDINATED** and possible duplication is eliminated;
- Research is **EFFICIENT** making best use of our research dollars;
- Research is conducted in an **EFFECTIVE** manner bringing results to the Canadian potato industry;
- Research priorities and results are **COMMUNICATED** to all industry stakeholders.

Strategy – Guiding Principles

- The strategy is built on the goodwill and collaboration of all industry stakeholders. Ongoing communications and engagement is necessary for the success of the strategy and ensuring proper return on the research investment.
- Designed to benefit all members of the industry, the strategy is industry led and coordinated.
- The strategy makes effective use of physical assets and researcher expertise available throughout the country.

Section 4: Strategic Priorities Areas, Strategic Outcomes and Objectives 2013-2017

The National Potato Research and Innovation Strategy identifies six priority areas within which research and innovation projects will be established. Given the breadth of these priority areas, it is conceivable that some areas attract a greater number of research projects than others. The national consultations provided some insights as to the relative importance of each area. Variety development, pest and disease management, as well as production management and agronomy, generated significant interest throughout the consultations and are listed in that order. Extension and technology transfer was identified as a weakness, and the Research Working Group concurred that significant improvements were required in this area. Finally, the areas of market research and alternative uses generated substantial discussions throughout the consultations and are considered as more moderate priorities. Details of the specific provincial priorities can be found in the respective provincial consultation reports.

The six areas are:

- Variety Development
- Pest and Disease Management
- Production Management / Agronomy
- Communication and Research Extension
- Market Research
- Alternative Uses for Potatoes

The following table presents the Key Priority Areas, along with statements of desired outcomes relative to each priority area. These strategic outcomes define the desired end state the strategy proposes to achieve for each priority. In addition to the strategic outcomes, each priority area proposes a set of strategic objectives that will guide those making decisions on where research investment should be directed (selecting research projects for funding). These strategic objectives have been established by reviewing the substantial number of proposed research priorities identified in the national consultations.

Key Priority Area	Strategic Outcome	Strategic Objectives
	<i>Statement of the desired outcome (or end state)</i>	<i>Statement of objective(s) required to achieved the desired state</i>
Variety Development High priority	A comprehensive variety development program is in place responding to environmental pressures, resource scarcity and consumer preferences.	To coordinate an ongoing variety development research program which can lead to varieties that: <ul style="list-style-type: none"> • Have increased resistance characteristics to disease and pests, and /or. • Require reduced inputs (nutrients, water, etc.), and/or. • Provide improvement in taste, appearance, ease of storage and processing characteristics.

<p><i>Pest & Disease Management</i> <i>High priority</i></p>	<p>A comprehensive research program that addresses existing and emerging pest and disease profile allowing Canadian growers to manage their crops efficiently.</p>	<ul style="list-style-type: none"> • To conduct disease-specific research having significant economic impact on the industry. Specific and particular emphasis is placed on PVY, Wireworm, Late Blight, Early Dying Complex, Scab and Zebra Chip. • To conduct research in integrated pest management.
<p><i>Production Management and Agronomy</i> <i>High priority</i></p>	<ul style="list-style-type: none"> • Canadian Growers benefit from the ongoing research in production management and agronomical techniques. • Production management and agronomy are advanced by research efforts in the areas of sustainability, innovations in production and storage techniques. 	<ul style="list-style-type: none"> • To conduct research in agronomic practices leading to the optimal use of inputs with specific emphasis on nutrient management and water management (including irrigation and drainage). • To conduct research on crop rotation practices to optimize yields and seed management use. • To conduct research in the innovative use of equipment, technology and production practices in order to maximize production capacity and profitability.
<p><i>Communication and Research Extension</i> <i>High priority</i></p>	<ul style="list-style-type: none"> • Research priorities and results are communicated to Canadian Growers • The application of research results is facilitated through a variety of programs and support. 	<ul style="list-style-type: none"> • To ensure all research proposals have extension mechanisms in place to facilitate transfer of knowledge and technologies to industry members. • To develop and implement communication tools and mechanisms to inform industry members on the research priorities, progress made on the priorities and results of the research efforts. • To embed a research extension capacity within all national potato research and innovation projects.
<p><i>Market Research and Consumer Education</i> <i>High / medium priority</i></p>	<ul style="list-style-type: none"> • Consumer and marketplace preferences are well known and drive research efforts • Consumers recognize and appreciate the nutritional value of potatoes 	<ul style="list-style-type: none"> • To conduct research on maximizing / improving the nutritional benefits of potatoes. • To conduct market research to identify consumer and market preferences as a means to assist in the development of new products. • To promote the nutritional value and benefits of potatoes (note: this may be out of scope for a research strategy...) • To develop research-specific information dissemination mechanisms for industry use.

Alternative uses for Potatoes
Medium priority

- An established research program investigates and develops alternative and innovative uses for potatoes and potato-based bioproducts.
- To conduct ongoing research to develop new markets / new uses for potato plants (whole plant use).

Section 5: Strategy Governance

The establishment of a coordinated approach to potato research is an important point of departure for the industry. The ability to identify research priorities based on industry needs and to direct funds where that research is most adequately conducted is a fundamental principle expressed by all provincial stakeholders. The following section presents strategy governance model proposed by the Research Working Group. Please note that this governance model is in a draft stage and refinements are still necessary.

Proposed Approach: A Starting Point

The strategy and its governance model must evolve over the course of time to meet the needs of the industry, researchers, and funders. The proposed governance structure features the Research Working Group as the primary governing body for potato research in Canada. The RWG recognized the need to conduct additional research to determine the optimal governance structure to leverage the advantages presented by Canadian taxation laws. The structure described in the following paragraphs is a starting point that will undoubtedly be further discussed and revised.

Governance Principles

Several fundamental principles were developed by the RWG in the course of the development of this Guidance Framework.

- Research is based on industry needs;
- Research must recognize and leverage existing research strengths throughout the country;
- Governance and funding of research are linked and the governance structure must recognize this important fact;
- Research extension is best achieved when projects are jointly led by scientists and industry;
- Project coordination and administration requires specialized, dedicated personnel to ensure compliance with funding contributions and that research results are adequately communicated to the industry.

Strategy Governance: Proposed Approach

The CHC / CPC

Under this structure the CHC / CPC is the organization with the authority over potato research and innovation. The RWG is proposing to continue playing a similar role on behalf of the Potato Council in being the organization responsible for the coordination of the National Research and Innovation Strategy and accountable for results to the CPC and ultimately growers.

RWG: Governance Body for the National Potato Research and Innovation Strategy

Under this proposed structure, the Research Working Group would be the primary strategy governing body with a mandate to:

- Determine the national and regional research priorities based on needs expressed by provincial organizations;
- Select where the best research outcome can be achieved for the investment (efficiency of research investment) – who is best suited to conduct the research using specific research assets.
- Oversee the administration of funding the research;
- And generally act as the focal point for potato research matters.

The RWG also discussed the need to broaden its membership in order to recognize the role played by non-growers in the area of potato research. Processors likely have an interest in potato research and having their voice heard when discussing research is considered as valuable and necessary.

National Research Coordinator

The creation of a position of National Research Coordinator was seen as an essential ingredient in the successful implementation and execution of the National Potato Research and Innovation Strategy. The coordinator's principal job functions would include:

- Support the RWG in the establishment of priorities;
- Conducting call for research proposal in light of the priorities identified by the RWG;
- Maintain ongoing liaison with provincial grower organizations, federal and provincial governments, processors and other stakeholders concerned with potato research;
- Coordinate the national research "portfolio" on behalf of the RWG;
- Report to the RWG on research projects.

Research Areas

RWG members recognized the need for wide ranging research – not just concentrating on topics that are urgent such as wire worm. The Key Result Areas Identified in the previous sections provides some insights in regards to the breadth of research topics. Consequently, the RWG felt that there were several research areas worth pursuing contingent on the availability of funds, and as a result there could be only two or three research areas that are active at one time. The research areas should be, but do not have to be necessarily aligned to the Key Result Areas. RWG members agreed however that most of the projects are likely to be associated with a specific research area. Depending on the number of projects, it is entirely possible that a research area will require a full or part-time coordinator to provide:

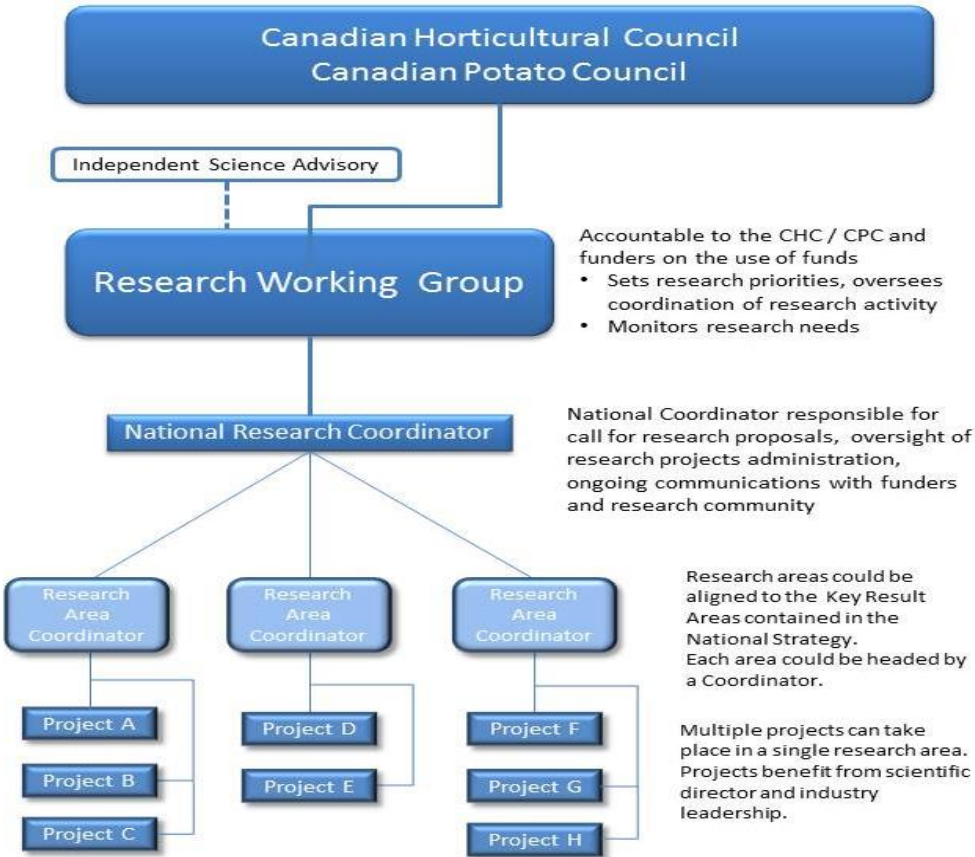
- Adequate administration and support to researchers (whose expertise is best used on science and not the administration)
- Report back to the members of the potato industry and research funders in a coherent fashion on research progress in their research area;
- Maintain the overall integrity of the research area and guard against "scope creep".

Research Projects

The analysis of the data provided during the provincial consultations clearly demonstrated the failure to ensure adequate technology transfer and extension to the industry. Research projects must integrate extension at the point of research design. Therefore, building on best practices, the RWG discussed the need for joint scientific and industry leadership on projects that are embedded in project governance structure.

Appendix A contains a diagrammatic representation of the governance structure.

Appendix A: Governance Model



Addendum: 2016 Key Research Priorities for the next Agricultural Policy Framework 2018 - 2023

The membership of the Canadian Potato Council's Research Working Group (RWG) includes potato grower representatives from across the country, as well as representatives from the processing industry. The RWG continues to play a key role in the execution of the National Potato Innovation and Research Strategy through activities such as identification and coordination of research priorities; and accountability for research results to the Canadian Potato Council and potato growers.

Research projects that addressed the 2012 National Research Priorities were conducted under the *Growing Forward Canadian Agri-Science Cluster for Horticulture 2*. Potato projects were funded at approximately \$8 million with growers, industry, universities and research funds contributing approximately \$2.3 million of the funding. The research projects selected for funding under Cluster2 were:

- Understanding of Potato Virus Y Complex in Canada and Development of a Comprehensive On-farm Management Strategy;
- Wireworm Control in Potatoes and Strategic Rotational Crops in Canada;
- Development of a Rapid and Sensitive Triplex Nested Real-time PCR Method for Quantification of *Verticillium* in Soil;
- Zebra Chip and Potato Psyllid Survey and Monitoring;
- Nitrogen for Improved Yield, Quality, and Profitability of Potato;
- Canadian Potato Variety Evaluation Program.

Project objectives and progress reports on the specific activities of this research can be found at:

<http://www.hortcouncil.ca/programs/cluster/cluster-2-potato-projects/>

During the summer of 2016, RWG members consulted with potato growers and industry stakeholders in their respective provinces to review the key priority areas for the next Agricultural Policy Framework. As an outcome of these consultations the following key priority areas for research were adopted by the Canadian Potato Council on November 14, 2016.

2016 Key Priority Areas for the next Agricultural Policy Framework 2018-2023

Creating Potato Varieties for Canada

Creating potato varieties for Canada remains a priority for the Canadian potato industry. It is recognized that this activity involves both variety development and evaluation in the diverse production regions of Canada. Key elements of this variety evaluation activity will include the proportional recognition of the various sectors (process, fresh) within Canada, and ensure that the selection of key traits including crop yield and evaluation of sector specific attributes are done in consultation with key stakeholders. National coordination of standards for variety evaluation may offer opportunities to maximize the outcomes of this research, where appropriate. It is expected that increasing development and use of genetic markers by breeders will have the potential to increase the efficiency of breeding and selection activities both at the very early stages of variety selection and at the stage closer to commercialization when a wide variety of characteristics are included in the evaluation process.

Soil Health and Fertility

Soil health and fertility is a priority area that includes specific activities targeted at increasing soil organic matter and carbon sequestration; strategies for soil borne disease and pest management through crop rotation, suppressive crops, high value rotational crops, and increasing and maintaining biodiversity.

Precision Agriculture, New Technology, and Data Driven Agriculture

Technology continues to evolve and represents new ways to improve the productivity and quality of Canadian potato production. Optimization of inputs by management zones, identified by imagery and remote sensing, and marker assisted diagnostics are areas that have been identified as research priorities.

Seed Quality and Physiology

High quality seed and optimization of stand establishment are critical factors for potato production. Research to address seed management and stand establishment (including whole and cut seed), mechanization, the use of calcium for seed tuber health, optimization of seed physiology for all regions, and the use of phosphorus acid on seed are all areas of priority to the potato industry.

Pest and Disease

Many pests and diseases remain as key priorities for the potato industry. The following is a list of pests noted by stakeholders and grower representatives during the recent priority setting exercise. Novel approaches for control, monitoring programs (including resistance management), development of best management practices, and improved extension strategies may be considered as priority areas for consideration. New technologies like RNAi gene editing and biopesticides could also be investigated as part of novel and effective management strategies.

Priority pests include: Colorado potato beetle, wireworm, scab (both powdery and common), late blight, early dying PVY (specifically transmission of novel strains).

Water Management

Water is a critical factor for optimizing potato yield and quality. The diversity of Canadian growing conditions also means that the specific priority areas related to water are variable across the country and include dealing with extremes such as drought or excessive moisture, optimization of irrigation for quality, and water use efficiency.

Storage and Post-Harvest Physiology

Specific activities identified in this category include the determination of variety specific storage management recommendations, disease management, investigation of sprout inhibitors as alternatives to CIPC, and quality management.