National Dairy Research Strategy

2022-2027

Investing in our Dairy Future

The five-year National Dairy Research Strategy (the "Strategy") has been developed to guide Dairy Farmers of Canada's investments in science, taking into account current issues and focusing on the present needs and priorities of the dairy sector to better position dairy farms and dairy products in the marketplace. The Strategy is also aligned with the organization's strategic objectives and pillars for a long-term vision for our sector.

The goals of the Strategy are to foster innovation, increase farm efficiency and sustainability, enhance animal health, care and welfare practices, and strengthen the role of dairy in human nutrition and health and in sustainable diets.

The Strategy was developed through extensive consultations involving a broad range of stakeholders from the scientific community and industry. The process, including a national online survey and multiple focus groups and workshops, resulted in the identification of targeted outcomes and research priorities under the three following areas: DAIRY FARM SUSTAINABILITY, ANIMAL HEALTH, CARE AND WELFARE, and DAIRY IN HUMAN NUTRITION AND HEALTH.

Note: This document may need to be adapted as sector priorities evolve. Future emerging issues affecting the sector may also require the funding of projects to address objectives not identified in this research strategy document.

Core research values

The following values are guiding Dairy Farmers of Canada (DFC) in the implementation of the Strategy:

COLLABORATION AND PARTNERSHIPS

DFC recognizes the need to strengthen partnerships with its member organizations, governments and stakeholders to build research capacity together for future sector growth. When eligible, the organization aims to finance research through competitive, public programs to obtain matching funding contributions.

DFC aims to maximize farmers' investments at the national and provincial levels through a coordinated and collaborative approach to research in dairy production and in human nutrition and health.

SCIENTIFIC INTEGRITY

DFC funds independent, credible research that is subject to a rigorous scientific peer-review process by external experts.

DFC has no decision-making role in the conduct of the studies, data collection, and analysis or interpretation of the data. Researchers are independent in conducting their studies, own their data, and report the outcomes regardless of the results, including the decision to publish the findings.

SOCIAL RESPONSIBILITY

DFC's investments in research provides the science-based evidence needed to continuously improve the stewardship of the animals and the responsible management of resources thus reducing the impact on the environment. This ensures the sustainable production of high-quality, safe, and nutritious food for consumers, contributing as such to the welfare of current and future generations.

KNOWLEDGE TRANSLATION AND TRANSFER

Knowledge translation and transfer is a critical part of the research continuum for sector growth. DFC commits to report on dairy research investments, to implement effective means of translating and transferring results to support dairy farmers' efforts to continuously improve their practices, and to communicate findings on the role of dairy products in a healthy and sustainable Canadian diet.

Dairy Farm Sustainability

TARGETED OUTCOMES AND RESEARCH PRIORITIES:

Sustainable feed cropping systems are defined for long term productivity

- Design crop rotation systems and study complex forage mixtures adapted to the region and soil type, intercropping, interseeding, double cropping and cover crop practices to improve soil health, control weeds, optimize yields and maintain nutrient value throughout entire season.
- Improve forage quality, yield and resistance (drought, flooding, winter survival) through breeding and management practices (for cropping and conservation), such as increasing the nutritive value, extending productive longevity and reducing fall dormancy of alfalfa and increasing the yields of grasses (regrowth) during the summer.
- Optimize best management practices for manure, nutrients, and pesticides in various cropping systems.
- Explore alternatives to plastic silage materials (e.g., bio-degradable materials, use of milk components in the development or creation of bioplastics, etc.) while ensuring that alternatives are not damaging to the environment (e.g., non-degradable residues or microparticles).

Canada-specific strategies to cost-effectively reduce greenhouse gases (GHG), maximize carbon sequestration and adapt to climate change are identified

- Identify strategies to mitigate GHG emissions (primarily from cows and manure management) that take into consideration the practicality, impact/effectiveness versus costs, using trans-disciplinary approaches (e.g., living labs or open innovation).
- Develop a recognized standardized methodology to measure on-farm carbon sequestration and assess its potential to offset dairy GHG emissions and to allow for global comparisons.
- Identify and evaluate, in the Canadian context, practices and new genetics of plants/crops and animals to tackle current and future challenges (e.g., novel pathogens, heat and cold stress, changing seasons, drought, floods/severe water strikes) associated with climate change.
- Investigate synergies/trade-offs between climate change adaptation and GHG emissions mitigation strategies.

The potential of innovative on-farm water use and conservation practices and technologies is assessed

- Develop practices or technologies to maintain soil moisture, even in drought conditions, limit water erosion during heavy rainfall and decrease water use associated with growing crops.
- Identify opportunities to re-use water and devise low cost on-farm water re-capture and treatment technologies.
- Explore the potential of concentrating milk (extracting water) on the farm or in a processing center (for example when transporting milk over long distances or between provinces) and estimate the impact on milk quality, transport, processing, on-farm by-product management, profitability, etc.

Cost-effective and concrete measures to increase biodiversity are clearly defined

- Assess and demonstrate the short- and long-term benefits and impacts of increased biodiversity on dairy farms.
- Investigate the potential of strategies such as pasture lands, complex crop mixture, use of plants in intercropping or on uncropped land (riparian zone, wetland restoration, woodlots, etc.), and other initiatives (e.g., bat boxes) to promote plant and animal biodiversity and pollinating insects.

Social and economic factors impacting adoption and implementation of any new practices on dairy farms are well understood, through integration of social and economic science into all research projects

- Assess the short- and long-term economic impacts of the adoption of new strategies, practices and technologies on Canadian dairy farms.
- Better understand barriers to the adoption of some recommended practices.
- Evaluate and identify means to gauge and monitor evolving societal acceptance of dairy farm practices among Canadians.

Animal Health, Care and Welfare

TARGETED OUTCOMES AND RESEARCH PRIORITIES:

Effective solutions to prevent and mitigate diseases and sustainably reduce the use of antimicrobials are developed

- Monitor endemic diseases (e.g., Johne's disease, leukosis) and emerging diseases (e.g., *Salmonella* Dublin infection, anaplasmosis, etc.) and develop effective practices and methods to reduce their prevalence, including better defining key biosecurity measures and investigating the development of promising new vaccines and other preventive technologies for priority diseases.
- Develop udder health monitoring systems, easy-to-use on-farm diagnostic tools, well-defined clinical treatment protocols and improved practices to prevent and control mastitis.
- Design quick, accurate, consistent, cost-effective means for routine locomotion assessments on farm (using Artificial Intelligence and other automated means) and easily accessible data monitoring systems to improve early detection, treatment and pain management of lameness in individual dairy cows and younger dairy cattle.
- Advance knowledge to reduce mobility issues and improve hoof health, focusing on the disease prevention, including housing and management, and early detection of digital dermatitis, sole ulcers and claw lesions.
- Provide strategies to reduce overall antibiotic use, especially Category I antimicrobials. Develop evidence-based effective protocols for lower categories antimicrobials and alternatives to antimicrobials while maintaining optimal animal health and welfare.

Dairy cattle nutrition and feeding knowledge is refined for improved feed efficiency, reduced production costs, and optimized milk composition and quality

- Advance knowledge in precision feeding through automation and assess the efficiency of these tools and systems. Evaluate the integration and use of precision feeding on commercial farms and methods to accurately measure and monitor individual dry matter and water intake and feed efficiency, including managing the impact of pasture/outdoor access on feeding protocols and management, and on GHG emissions.
- Increase knowledge on use/upcycling of by-products and co-products as feed ingredients in a context of sustainable development.
- Optimize transition period feeding and management practices to reduce metabolic disorders.
- Understand more thoroughly the impact of water profile, feeds and feeding on milk composition/processing properties and improve the ability to monitor milk composition and quality continuously at individual and herd levels (including alternatives to increase milk fats).

Practical and sustainable (environmentally, economically and socially) housing and management options are identified and adapted to evolving Canadian climate change for the best care and welfare of dairy cattle of all life stages

- Identify international trends and practices in best dairy management and housing practices and how they can be adapted to the Canadian context.
- Create housing designs of the future that will increase animal welfare and mitigate environmental impact, incorporating features of naturalness, using renewable materials and resources, adapted to Canadian climate change (wide temperature variations, heat stress, cold stress), integrating precision livestock farming technologies and considering wise energy consumption and generation while preventing stray voltage.
- Investigate the impacts of new construction and renovations of housing systems (e.g., recycled manure bedding, compost pack barn, outdoor/pasture access, etc.) on animal health, welfare and handling, onset and development of mobility issues and other injuries, and potential trade-offs between animal welfare, production, labour, cost and environmental sustainability.
- Expand low-stress handling and transportation knowledge and know-how for all age groups of cattle.
- Continuously improve calf management for long-term health and performance, through optimal calving management, housing and caring of neonates.
- *(Define solutions to facilitate adaptation and compliance with emerging and new updates to the Dairy Code of practices.)*

Strategies and tools to improve genetics and reproduction performance are created

- Continuously advance the genetics of Canadian dairy cattle to reduce environmental impacts, improve animal health, welfare and reproduction and adapt to climate change, while promoting genetic diversity.
- Develop targeted reproductive strategies that minimize interventions while maintaining/improving fertility.
- Evaluate alternative breeding strategies (like extended lactation, beef cross breeding, etc.) that ensure reproduction efficiency and optimal management of calves destined for purposes other than dairy production.
- Better understand the effects of genetics (e.g., A2) on the composition of milk and its processing properties.

Dairy in Human Nutrition and Health

TARGETED OUTCOMES AND RESEARCH PRIORITIES:

The contribution of dairy products as whole and unique foods in optimal health and wellness across the human lifespan is strengthened

- Improve the understanding of the impact of dairy products on optimal growth and development in children and adolescents.
- Reinforce the benefits of dairy products in musculoskeletal health.
- Identify the effects of dairy products on healthy aging (particularly on preserving mobility, cognition and nutrient adequacy) in older age.
- Further define the role of dairy products in supporting healthy weight and body composition (including supporting satiety).
- Investigate the role of dairy products and milk components, amongst others A2 beta-casein, in a healthy gut, including intestinal integrity and digestibility, and on the microbiome.

The role of dairy products as whole and unique foods (particularly full fat milk, yogurt and cheese) in chronic disease prevention and management is reinforced

- Identify the specific impact of including dairy products in healthy plant-based dietary patterns on various health outcomes.
- Further support the role of dairy products in cardiometabolic disease (CVD, hypertension, Type 2 diabetes) prevention and management.
- Contribute to build convincing evidence for the role of dairy products in colorectal cancer prevention.
- Expand the understanding of the role of dairy products in breast cancer prevention.

The value of dairy products as whole and unique foods within healthy sustainable diets in a Canadian context is further recognized

- Identify the differential health effects and nutritional attributes of dairy products in relation to plant-based alternatives.
- Determine the value of dairy products within healthy sustainable diets in supporting nutrient adequacy, considering nutrient bioavailability and protein quality.
- Assess the effects of dairy products within healthy sustainable diets in a Canadian context taking into consideration the four key dimensions of healthy sustainable diets (human health and wellbeing, environmental impact, affordability, and cultural acceptability).

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