Project

Reducing the water footprint of milk production in current and future climates

DAIRY RESEARCH CLUSTER 3
FOR A PRODUCTIVE, INNOVATIVE AND SUSTAINABLE SECTOR

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National Dairy Research Strategy investment priority targeted:

- Reduced environmental footprint including GHG (enteric methane), energy and water

PERIOD: 2018-2022

TOTAL BUDGET: $706,438

Why this research is important:

The dairy sector's social license depends on demonstrating effective environmental stewardship. Dairy Farmers of Canada's proAction® Initiative for milk quality and sustainability promotes and demonstrates farmers' continuous improvement in various areas, including the environment.

Sustainable water management and climate change adaptation are high priorities for dairy farmers in Canada and internationally. Dairy farms rely on water as an essential input for milk production, and they have identified a need to proactively manage freshwater resources. Indicators of sustainability, such as the water footprint, are being reported in scientific literature and popular press. Consumers are interested in the environmental implications of their purchasing decisions. At the farm-level, water resources are increasingly under scrutiny from regulatory agencies, and, in several jurisdictions, dairy farms are required to report their water intake. Measuring water use is also the first step to developing and implementing on-farm water conservation methods.

One of the largest in-barn opportunities to conserve water and reduce the water footprint is minimizing heat stress. The frequency and extent of heat stress episodes in Canada is expected to increase with climate change. Heat stress occurs when a cow cannot dissipate an adequate quantity of heat to maintain thermal balance, and it negatively affects milk production, reproduction and the health of dairy cows, leading to lost revenue.

Research objectives:

- Characterize in-barn water use and identify best management practices to reduce water use and increase efficiency;
- Assess heat stress in dairy cows and evaluate abatement options in current and future climates; and,
- Evaluate practical treatment methods for managing effluent from farmstead "hot-spots", specifically bunker silo runoff (i.e. silage effluent).

Project overview:

Building on previous research and findings from the Dairy Research Cluster 2 (2013-2018) on measuring the water footprint of milk production, and on guidance documents from the International Dairy Federation on water footprint assessments, this project will take on-farm measurements of water use (in-barn and wastewater) and heat stress indicators in Alberta, Ontario, Quebec and Nova Scotia. Researchers will characterize the water use of participating farms and aim to reduce in-barn water use by instrumenting their barns with flow meters. Collected data will serve to develop region-specific water use benchmarks, to be incorporated into models for analysis of scenarios. This will enable the team to evaluate management practices to improve water use efficiency in different regions while also considering trade-offs, such as energy and economics.

As a second area of investigation, the project will study heat stress indicators in barns with different designs and ventilation systems, in test sites across the country. Scenario assessments will be undertaken to evaluate heat stress using the collected data, testing abatement strategies and estimating lost productivity resulting from heat stress.

In a third area of study, the researchers will evaluate low-cost systems for collecting and treating nutrient-rich runoff, and test new technologies with the potential to remove phosphorus and other nutrients from wastewater.

Expected outcomes:

The project will identify forward-looking opportunities and challenges, and evaluate management practices and strategies to improve farm resilience to weather extremes and climate change, as well as to further reduce the water footprint of milk production in Canada by improving water use efficiency on dairy farms. Best management practices will be identified for managing wastewater and filtering phosphorus from runoff.

The participation of eight Canadian dairy farms will contribute to the successful completion of the project.

FUNDING PARTNERS:

CANADIAN AGRICULTURAL PARTNERSHIP

DAIRY FARMERS OF CANADA

Canada

NOTE: As per the research agreement, aside from providing financial support, the funders have no decision-making role in the design and conduct of the studies, data collection and analysis or interpretation of the data. Researchers maintain independence in conducting their studies, own their data, and report the outcomes regardless of the results. The decision to publish the findings rests solely with the researchers.