

Horizon Series: Livestock and water use

White Paper Highlights with Dr. Andrew VanderZaag,
Agriculture and Agri-Food Canada

As part of its Horizon Series, the Livestock Research Innovation Corporation (LRIC) has written a series of white papers on issues impacting livestock producers and the entire livestock value chain. In this issue, Dr. Andrew VanderZaag discusses the various aspects of water use on dairy farms. Andrew completed his undergraduate degree at the University of Guelph and his PhD at Dalhousie University. He is a research scientist with Agriculture and Agri-Food Canada in Ottawa focused on the environmental aspects of livestock production, is leading a Canadian study on water use in dairy barns, and co-authored LRIC's white paper Livestock and Water Use.

"What does it mean to use water?" Dr. Andrew VanderZaag

Water use involves more than just what comes through the faucet, and it's different than other resources, explained VanderZaag, because after using water it isn't always gone. He focused on two key things when it comes to using water: water consumption when water is moved out of the watershed or when water is evaporated from a watershed and moves somewhere else, and the degradation of water quality.

VanderZaag reviewed some key terminology when it comes to water use and management, and key water footprint terms.

- Water withdrawal—when water is pumped out of the ground or from a surface source
- Water consumption—when water that was withdrawn is moved out of the watershed (through transportation or evaporation), and non-consumptive uses are when water is returned to the watershed
- Water degradation—when water quality is decreased
- Blue water—pumped water
- Green water—evapotranspiration or precipitation that is essentially the use of rain water
- Grey water—virtual water component calculated based on nutrient pollution, leaching or runoff

"I want to put livestock water use in context in Canada." Dr. Andrew VanderZaag

Based on 2001 data, livestock watering and water use on livestock operations was estimated to

be about 5.5% of all water withdrawal in Canada. And the majority of that (93%) was from irrigation in British Columbia, Alberta and Saskatchewan. But VanderZaag cautioned how these estimates are based on assumptions, and it's important to look on a local level and at individual production systems to get more appropriate numbers of water use on livestock farms.

In Ontario, livestock water use is estimated to account for 30% of all agricultural water use in the province, mostly related to direct drinking water. In terms of scarcity and impact of water withdrawal, it depends on where and when the water is being used. There is also the aspect of water productivity to consider—how much water is used as an input and how productively that input is being converted into either kilograms of product or other metric.

“Consider direct and indirect uses of water.” Dr. Andrew VanderZaag

There are direct and indirect uses of water in livestock production. Direct involves what the animals use as drinking water. Indirect uses are involved in feed and energy production, and nutrient management, and activities that optimize these uses will benefit overall water use. VanderZaag reinforced the importance of thinking about how to increase water productivity. Anything that can be done to improve the productivity of the animal—increased feed conversion efficiency—will have a water benefit in terms of output per unit of water input.

“Direct on-farm water use are things that farmers have the most control over.”

Dr. Andrew VanderZaag

Controlling on-farm water use also brings a benefit to the environment and potentially input costs. We want animals to drink freely, but water is also used for cleaning and for cooling—misting or heat exchangers—and there are costs associated with these uses. Water must be pumped out of the ground, it may require treating to modify quality, it is stored in manure if water is used for cleaning, and then there are costs to transport water in the manure.

“Farms with different milking systems have different water use and different opportunities to optimize water use.” Dr. Andrew VanderZaag

VanderZaag reviewed a couple approaches for improving drinking water productivity on livestock farms. When cows have excess protein and salt in the feed it increases drinking water requirements, so optimizing levels in feed will optimize water use. When it comes to cleaning water, VanderZaag shared tips that some farmers in Canada are using to reduce water use in milking parlours, barns and cleaning including scraping down areas before washing, pre-soaking and using high-pressure nozzles. One farm uses rainwater to reduce water intake, and another reduced the size of tip tanks so when water was refreshed in troughs, less water was discarded.

His research has also been looking at nutrient losses associated with the degradation form of water use (grey water). On one end of the technology spectrum, he is looking at passive systems that use biophysical processes to remove nutrients. For example, an on-farm system that removes



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nutrients from milk house wash water or another system that uses iron slag filters to remove phosphorus and nutrients from bunker silo runoff. One BC farm he's worked with has a high-tech approach to recycling water. They have a nutrient recovery system that separates nutrients in to concentrated fractions from manure. The liquid fraction has very low nutrient content and is used for irrigating crops, and the solid nutrient rich content is spread on fields.

Watch the full webinar or review the white paper at livestockresearch.ca/white_papers.

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