

# Clean Resources

Smart Agriculture and Food

## Smart irrigation through observation and prediction

Increasing water use efficiency (the ratio between actual water used by crops and water withdrawn for agricultural purposes) through site-specific irrigation management is an important tool in ongoing regional development of high-value agricultural products in southern Alberta. Variable Rate Irrigation (VRI) is an important technology, although uptake of the technology is low and its use is suboptimal. This project aims to integrate various types of sensors to develop a model-based, closed-loop irrigation system based on the spatial distribution of soil moisture and crop water availability. The smart system will include microwave radiometers for moisture mapping, point sensors and simulation models to create maps of irrigation requirements. The project promises to be a decisive step toward reaching the full potential of VRI technology.



Photo credit: Maik Wolleben

### FUNDING DETAILS



**RECIPIENT:**  
Lethbridge College  
PI: Dr. Willemijn Appels



**PARTNERS:**  
Alberta Agriculture and Forestry  
Skaha Sensing  
University of Alberta



**TOTAL BUDGET:**  
\$49,950



**AI FUNDING:**  
\$49,950



**PROJECT DATES:**  
March 2020 –  
May 2021



**PROJECT TRL:**  
Start: 5  
End: 7

## APPLICATION

Site-specific irrigation management, such as VRI, can reduce agricultural water use. To advance the use of VRI technology, progress needs to be made on decision support tools for this technology. This project tests sensor equipment and simulation models to create new decision support tools, and works toward high-performance, smart, closed-loop irrigation systems.



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### PROJECT GOALS

- Develop a sensing network that can form the basis of a closed-loop irrigation system for centre pivots.
- Build simulation models of soil moisture dynamics, plant-available water, and crop water use, to combine with different combinations of observations to determine an appropriate irrigation application.
- Build towards a demonstration version of a variable rate irrigation pivot under a smart closed-loop control system.

### BENEFITS TO ALBERTA

- Currently, farmers and consultants have access to technology that can apply varying amounts of water to a crop in a field during a single revolution of a centre pivot (VRI technology). However, until now, there is no reliable way to monitor the spatial variability of plant available water or to assess the effects of varying irrigation amounts at the same spatial resolution.
- The ability to create maps of plant-available water is expected to increase accessibility and commercial uses of smart VRI technologies to irrigation farmers and consultants and allowing them to make data-driven decisions.
- From an environmental perspective, the project will increase water productivity and water use efficiency in southern Alberta.



2 Publications



4 Students  
Trained



2 Project Jobs



2 Future Jobs



1 New  
Product/Service

### CURRENT STATUS

#### March 2021

The microwave sensors were installed and tested in fall 2020 at the Alberta Irrigation Technology Centre. Currently, a site analysis is being performed to determine the optimal location for the soil moisture monitoring equipment that will provide the ground-truthing data for the microwave sensors. The sensor network will be used to in an experimental decision support system for irrigation of four crops in the 2021 growing season.