

Low-Cost Soil Moisture Calibration and Technology Farm Operation

1. Extension mentors and application contact information

Ansley Brown, Assistant Director, Irrigation Innovation Consortium, Ansley.Brown@colostate.edu

2. Other mentors

Dr. Jay Ham, Professor of Micrometeorology, Department of Soil and Crop Sciences, Jay.Ham@colostate.edu

Dr. Timothy Martin, Executive Director, Irrigation Innovation Consortium, Timothy.Martin@colostate.edu

Joel Schneekloth, Water Resources Specialist, Water Center and Extension, Joel.Schneekloth@colostate.edu

Adrian Card, Extension Agent – Agriculture/natural Resources, Boulder County Extension,

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3. Region

- a. Irrigation Innovation Consortium Headquarters (IIC HQ) – Technology farm located in Fort Collins, CO on Prospect Road and I-25

4. Internship Goals, Scope, and Objectives

- a. Goals
 - i. Provide experience in research project design and implementation
 - ii. Familiarize the student with on-farm applied research
 - iii. Provide hands on knowledge and experience in research and business relationship development for consortium projects
- b. Scope
 - i. The student(s) will work directly with the Irrigation Innovation Consortium (IIC) research staff at IIC HQ and learn basic farm management skills by assisting with daily farm activities, while simultaneously learning applied research techniques for installing and calibrating experimental soil moisture sensors for improved irrigation scheduling. Business development experience gained by the student(s) will be from the development of academic-industry relationships necessary to the IIC's mission of public and private resources to meet common research needs.
- c. Objectives
 - i. Develop and implement an experimental design for calibrating experimental low-cost soil moisture sensors developed by Dr. Jay Ham's lab with collaboration from the IIC. Sensors will be installed at both IIC HQ and the U.S. Central Great Plains Research Station in Akron, CO.
 - ii. Improve cloud database of soil moisture sensor data, and integrate the developed calibration algorithm into the cloud as a post-process.
 - iii. Learn and understand basic farm management, specifically irrigation management using multiple techniques in surface irrigated systems
 - iv. Attend at least one IIC industry partner tour and business development discussion

5. How was the applied research project identified?

Recent developments in low-cost wireless modules, 3D printing, electronics, and Internet-of-things connectivity suggest that soil moisture sensor networks may now be affordable. Research is needed to explore this concept and determine if it warrants additional research as an irrigation management tool.

6. Stakeholder groups

IIC, IIC HQ, Dr. Ham's research lab, AeXonis (owner of wireless technology), and other [IIC Industry partners](#)

7. Learning Outcomes

- a. Upon completion of the internship, the student will have demonstrated:
 - i. An ability to perform basic farm management duties while simultaneously collecting quality research data based on an experimental design
 - ii. Proficient technical skills for soil moisture sensor calibration and database management
 - iii. Effective communication skills and demonstrate the ability to present ideas with clarity to potential business partners and non-academic persons.

8. Travel Funds

- a. Students, if meeting all of the CSU requirements, will be able to use the CSU vehicles stationed at IIC HQ to travel to Akron and back for day trips to install the soil moisture sensors.