

### 32. Low-Cost Soil Moisture Sensing and Database Integration

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Location: Fort Collins, CO

#### 1. Extension mentors and application contact information

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#### 2. Region

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

#### 3. Internship Goals, Scope, and Objectives

- a. Goals
  - i. Provide experience in research project development 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 intern will work directly with the Irrigation Innovation Consortium (IIC) research staff at IIC HQ to gain hands-on research project development experience as well as experience in developing academic-industry relationships as part of the mission of the IIC.

The research project will focus on developing and integrating a low-cost soil moisture sensor that can be used to correct irrigation scheduling software water-balance calculations.

The business experience gained 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. This will involve hands-on experience in meeting new companies/organizations and going

through the IIC partnership process, as well as maintaining current business relationships.

- c. Objectives
  - i. Develop and integrate low-cost soil moisture sensors into an accessible database for use in correcting irrigation scheduling software (e.g. WISE)
  - ii. Participate in at least 3 IIC partnership development meetings to gain knowledge on academic-private relationships
  - iii. Provide at least 1 research farm tour to non-IIC related persons.

#### **4. PRU Activities**

- a. Cropping Systems and Natural Resources

#### **5. Learning Outcomes**

- a. Upon completion of the internship, the student will have demonstrated:
  - i. Ability to work as a team member of a research group to design and conduct an on-farm research project
  - ii. Develop technical and knowledge-based skills in irrigation management and sensor and database development
  - iii. Develop effective communication skills and demonstrate the ability to present ideas with clarity to potential business partners and non-academic persons.

#### **6. Identified Stakeholder Needs**

- a. WISE is a user-friendly, cloud-based app that aids in irrigation scheduling for field crops in Colorado. The user is given a daily estimate of the root zone soil water deficit (D, net irrigation requirement) through a Web interface or smartphone Apps. Once a user sets up a field using the Web-based tool, WISE automatically downloads field-specific soil properties and daily weather data [crop evapotranspiration (ET<sub>c</sub>) using crop coefficients, rainfall] from the nearest automatic weather station(s) to estimate the daily water balance of the soil root zone. The user needs to input actual gross irrigation amounts to get accurate estimates of D from the WISE water balance model. WISE was shown to adequately estimate water requirements for irrigation scheduling based on comparisons of WISE-calculated and field-measured D values. Example applications of WISE in Colorado for tactical irrigation scheduling, estimation of actual ET<sub>c</sub>, and exploration of the feasibility of variable rate irrigation (VRI) are described.

WISE has shown to be even more effective at improving irrigation scheduling and thus water use efficiencies, by correcting weather predicted soil-water status with observed soil moisture sensors data. The issue at hand is that current commercial sensors are relatively expensive for the value irrigators are willing to spend and come with a burden of data management that make their use impractical.

Through this internship, the student will focus on developing a low-cost soil

moisture sensor and database that could potentially be used with the WISE program.

**7. Travel Funds**

- a. No funds are available for travel/housing. All relevant projects/meetings will be hosted at the IIC HQ in Fort Collins, CO.