Ag Technology Internship

**Project:** Evaluating Distribution Uniformity of Agricultural Sprinkler Systems in Louisiana  
**Faculty Advisor:** Stacia L. Davis, Ph.D.

Irrigated agriculture in the mid-South has become a normal practice that heavily relies on readily available groundwater resources. Acreage under irrigation continues to increase in Louisiana, rising from 43% in 2014 to 49% in 2017, despite high annual rainfall averages. Also, many aquifers have become strained while experiencing increasing competition between public, industry, and agricultural sectors. Thus, agricultural irrigation must become more efficient to help achieve sustainable groundwater withdrawals in Louisiana’s struggling aquifers.

Irrigation efficiency has many components ranging from how the water is applied (e.g. system design, equipment selections) to timing and volume (e.g. human decisions, technological accuracies). As a result, it’s very difficult to quantify the overall efficiency of irrigation. Instead, various evaluations can be used as indicators of performance due to their contribution to overall efficiency. The objective of this study is to estimate the efficiency of agricultural sprinkler irrigation systems using the performance indicator of distribution uniformity.

During the 10 week internship, the student will work with the faculty mentor and LSU AgCenter staff in designing the test, collecting or constructing materials, and performing the evaluation. Afterwards, the student will work with the collected data to model the results and run various scenarios to develop recommendations for operation and improvements. Scenarios will be based on estimated seasonal irrigation requirements, current equipment configurations, and potential upgrades to system components (such as updated sprinkler packages). A research article with finalized study results should be submitted to a peer-reviewed journal by the end of the internship or shortly thereafter.

**Qualifications**

1. **Minimum qualifications:** Rising juniors and seniors from LSU and partner institutions with at least a 3.0 GPA are most competitive. Second-year students and those with a minimum 2.5 GPA are also eligible and encouraged to apply. The intern must be seeking a degree related to water science or engineering such as agricultural engineering, agricultural technology, water resources engineering, hydrology, natural resources, or other related discipline. He/She must demonstrate strong skills in reading/writing and the use of MS Office products such as Word and Excel.

2. **Preferred qualifications:** 3.25 GPA in coursework applicable to the project description. Given the nature of the work and short timeline of the internship, preference will be given to technologically-inclined students. Experience in field data collection, basic numerical modeling, and statistical analysis is also preferable. The ability to demonstrate deductive reasoning skills and independent thought are a plus.
3. **Physical qualifications**: The intern must be able to work in the harsh conditions of Louisiana agriculture, including up to 100°F ambient air temperatures at 100% relative humidity and in direct contact with agronomic crops. Additionally, he/she should expect to have direct contact with dirt, mud, and water while conducting the study. It is possible that the intern will need to use tools such as a gas-powered auger, shovels, drills, or other supplies to install or remove equipment from the study area. Training and supervision will be provided as required.

**Location**: Red River Research Station, Bossier City, Louisiana

**Weeks 1-3** Orientation and research project background
- Tour Red River Research Station (RRRS) facilities, including a half-day seminar of faculty/student presentations to learn about on-going research
- Attend a producer-led Caddo Parish Soil and Water Conservation District (Caddo SWCD) meeting to learn about water-related resource concerns
- Tour the Red Bayou Irrigation Project, owned and operated by the Caddo SWCD, and some locally irrigated row crop fields with producer(s), extension agent(s), and NRCS
- Participate in irrigation-related research activities including installing lay-flat tubing, conducting computerized hole selection, and soil moisture sensor installations
- Perform a guided literature review of irrigated agriculture in the mid-south, irrigation technologies, and software platforms for determining sprinkler distribution uniformity

*Milestone*: Literature review summary document with a research hypothesis/objective

*Expected Results*: The student had stakeholder interaction, hands-on field experience, and access to on-going and published research to obtain the necessary background.

**Weeks 4-9** Conduct research project and participate in extension activities
- Develop a written research plan with detailed procedures necessary to conduct the distribution uniformity testing using catch-cans and soil moisture data
- Design/build catch-cans for collecting irrigation volumes under sprinkler devices
- Map the crop areas and determine irrigation requirements based on site information

*Milestone*: Written materials and methods added to literature review
- Conduct the experiment on the RRRS walking linear sprinkler system (purchased 1984, original sprinkler package) and on a producer’s center pivot system (purchased 2014)
- Utilize Space Pro software (Center for Irrigation Technology, Fresno, CA) to graph the experimental results and statistically analyze performance of each system
- Calculate the seasonal irrigation requirements under current system performance and compare them to potential future system performance if updated for efficiency
Milestone: Develop both theoretical and practical recommendations for improving distribution uniformity and appropriate irrigation schedules based on crop, soil, and weather characteristics.

- Participate in the LSU AgCenter row crop field days (potentially Bossier City, St. Joseph, or Alexandria) and the Morehouse Parish Black Farmer’s Association Field Day

Expected Results: The student designed and conducted a research project, analyzed the results, and interpreted the results to provide recommendations on operation and improvements.

Week 10 Disseminate scientific knowledge to the community

- Finalize the report and submit to Journal of Contemporary Water Research and Education
- Write a blog post that summarizes the study and results for the public
- Participate in a seminar presentation of the research study to the interested public that may include producers, extension agents, faculty and NRCS personnel

Milestone: Submitted journal article, blog post, and recorded seminar presentation

Expected Results: The student gained knowledge of mid-south agricultural irrigation systems, the scientific method, and various software packages. Also, the student gained knowledge of the LSU AgCenter’s role in applied research and extension through participation in the program.