

21. **On-farm applied wheat research and extension**

Mentors: [Wilma Trujillo](#), [Jerry Johnson](#), [Sally Jones-Diamond](#)

Location: Northeast Colorado (Weld, Morgan, Washington, and Logan counties)

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

Wilma Trujillo

Area Agronomist

Logan and Morgan Counties

2. **Region**

Peaks and Plains Region – Northeastern Colorado (Weld, Morgan, Washington and Logan counties)

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

a. **Goals**

- Familiarize the student with on-farm applied research
- Offer an opportunity to gain experience with research methods and scientific principles
- Provide hands on knowledge and experience in research and extension
- Develop an understanding of the role of CSU Extension to generate, adapt and transfer appropriate technologies for improved and sustainable crop production systems in Colorado
- Prepare the student for professional employment

b. **Scope**

The intern will work directly with Extension Agronomists during the growing season (mid-May to mid-August) to gain hands-on crop production experience as an Agronomy Extension Agent.

The internship is designed to give broad based exposure on the day-to-day activities of on-farm research projects (crop variety performance trials, sorghum and wheat fertilization). The intern will be expected to participate in all aspects of the research, designing, planting, plot maintenance, soil and tissue sampling, data collection, harvest, and data analysis.

The intern will be expected to present the preliminary results of the on-farm research project at field days and/or crop production conferences.

c. **Objectives**

- Assist the student's development of employer-valued skills such as teamwork, communications and attention to detail

- Expose the student to the environment and expectations of performance for agricultural professionals working on research and extension
- Enhance and/or expand the student's knowledge on crop variety performance testing, crop nutrition and soil fertility

4. PRU Activities

- a. The on-farm research project will be highlighted at the Wheat, Corn and Sorghum Field Days in the Summer and fall of 2020
- b. Preliminary results will be presented at the 2020 Eastern Colorado Crop Production Conference in December 2020.

5. Learning Outcomes

Upon completion of the internship the student will have demonstrated:

- a. Ability to work as a team member of a research group and with grower cooperators, to design and conduct an on-farm research project
- b. Develop technical and knowledge-based skills in crop variety testing, crop nutrition and soil fertility
- c. Develop effective communication skills and demonstrate the ability to present ideas with clarity to an appropriate audience (crop producers and agricultural consultants)

6. Identified Stakeholder Needs

Increasing demand for high-quality wheat within the milling and baking industries—to ensure adequate protein levels in their products—presents both opportunities and challenges to Colorado wheat growers. Notably, high-protein wheat can be marketed at a premium, whereas low-protein wheat incurs a discount. Wheat yield and protein content are influenced by many factors, but the most important management practice under producer control is the rate and timing of nitrogen (N) fertilizer application. As a result, wheat growers have become increasingly interested in implementing profit-maximizing N management practices that account for the quality and pricing factors.

Since the availability of N in-season is environmentally dependent, the common practice of soil testing before planting is not suitable for detecting N deficiencies and requirements later in the growing season. Field analysis procedures (tiller counts) and chemical analysis of soil and plant tissue are effective for monitoring N status during the growing season. However, the main problem with these methods is the time and cost required for sampling, analysis and recommendations of rates to meet the demands of the growing crop. Delaying N applications may reduce yield, protein quality, and profit potential.

The N-Rich Strip is a newly developed method that accounts for the temporal variability effect on the crop's N requirement during the growing season. The growing crop can accurately show how much N was delivered for “free” (mineralized N) when comparing an N-Rich Strip with an area that represents the farmer's N rate (N check). Optimum top-

dress N rate for maximum yield, protein and economic profitability can be determined by using the N-Rich Strip method.

The N-Rich strip is used in conjunction with the GreenSeeker™ handheld sensor to determine in season N rate for optimum yield and protein content. The GreenSeeker™ measures Normalized Difference Vegetative Index (NDVI) which is calculated from the reflected light from the canopy of the crop. This value provides a highly accurate estimate of plant biomass. Therefore, yield potential can be predicted in-season using both sensor and some known climatic data (precipitation, growing degree days, soil moisture) from planting to sensing. By knowing the yield potential of the N-Rich Strip and the yield potential of the rest of a field (farmer's N rate or N check), the N rate for optimum yield and protein can be calculated. The N-Rich Strip and GreenSeeker™ technology package can be implemented at a relatively low annualized cost when spread out over multiple years and rotation crops, and stands to increase the profitability of wheat production in Colorado if the yield gains, quality improvements, and N cost savings are sufficient to offset these added technology costs.

Conducting this on-farm applied research and extension project will provide an opportunity to a core group of innovative grower-collaborators to evaluate the N-Rich strip practice in conjunction with the GreenSeeker™ handheld sensor under local growing conditions. Peer-to-peer knowledge transfer is one of the most important ways growers learn about new management practices. Strategic cooperation with well-connected and innovative growers allows Extension personnel to leverage the social connections and community standing of cooperators to expand knowledge transfer of successful production practices beyond the reach of the traditional Extension network. The project will make it easier for area producers to evaluate and adopt new Wheat nitrogen management practices.

Through this internship and the on-farm research and extension project, the student will learn to make the link between basic and applied research and how, through research and extension we can impact people, their farming practices and the environment.

7. CSU Faculty Associated with the Project

Dr. Jerry Johnson
Professor
Crop Testing Extension Specialist
Department of Soil and Crop Sciences

Sally Jones-Diamond
Research Associate
Department of Soil and Crop Sciences

8. Mentor Experience and Approach

Members of this team have mentored undergraduate and graduate students from different disciplines. Our approach is to build a relationship with the student, help the student to learn and grow, and express clearly his/her roles and responsibilities, expectations and boundaries. We will take the role of coaches, stimulate him/her to share their assumptions and ideas and always magnify the positive core by acknowledging and giving positive and constructive feedback and encouraging. The intern will be in the driver's-seat when assessing issues, challenges and problems so that him/her make connections and see options that they did not consider before. We encourage and empower him/her to be a solution-finder and resourceful.

9. Travel and Housing Funds

No county funds are available for housing. Funds will be available to travel among the CSU Extension Offices and on-farm research sites.