

17 – Crop Nutrients and Crop Production

1. Extension mentors and application contact information

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Area Agronomist

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2. Region

Peaks and Plains Region – Northeastern Colorado (Weld, Morgan, Washington, Logan and Sedgwick 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 an on-farm research project (Corn response to foliar applied iron and zinc fertilizers). 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 nutrition and soil fertility

4. PRU Activities

- a. The on-farm research project will be highlighted at the Corn and Sorghum Field Day in the fall of 2019
- b. Preliminary results will be presented at the 2019 Eastern Colorado Crop Production Conference in December 2019.

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 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

While discussion on crop nutrition is often around nitrogen, phosphorus, and potassium, optimal plant performance and nutrient use efficiency is achieved when all 13 of the essential nutrients are supplied to the plant. The 13 essential nutrients taken up from the soil solution are the primary nutrients: nitrogen, phosphorus, and potassium; the secondary nutrients: sulfur, calcium, and magnesium; and the micronutrients: boron, chlorine, copper, iron, manganese, molybdenum, and zinc. If any one of the essential nutrients is limited, so are yield, crop quality and ultimately profitability.

Deficiencies of micronutrients are common to crops grown on Colorado calcareous soils, mainly due to soil alkaline pH as well as to the presence of CaCO_3 (free lime). Among the most common micronutrient deficiencies observed are Fe and Zn, particularly in corn and sorghum. To prevent these deficiencies, inorganic salts or metal-organic complexes (chelates) are applied.

Recently, there is increasing interest from eastern Colorado crop producers in micronutrient fertilization for a variety of reasons: (i) soil erosion and long-term cropping have resulted in the removal of micronutrients from soils; (ii) increasing crop yield generally leads to greater micronutrient removal rates in grain and other harvested products (crop residues); and (iii) increased use of high-analysis NPK fertilizers containing lower quantities of micronutrient contaminants. Collectively, these factors and soil chemical properties have led farmers to question whether micronutrient fertilization may now be required to meet the changing demands of crop nutrition.

Conducting this on-farm applied research and extension project will provide an opportunity to a core group of innovative grower-collaborators to evaluate Fe and Zn fertilizer products under local growing conditions. Peer-to-peer knowledge transfer is one of the most important ways growers learn about new production 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 Fe and Zn fertilization 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. 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.