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WICS Conference 2022: Driving Research, Teaching, and Extension Impact

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WATER AND INTEGRATED CROPPING SYSTEMS

2022 WICS CONFERENCE

Water and Integrated Cropping Systems

Driving Research, Teaching, and Extension Impact

November 30 & December 1

GRADUATE HOTEL

141 N. 9TH STREET

LINCOLN, NE

Find us at https://wics.unl.edu/

Dear Colleagues,

The Water and Integrated Cropping Systems (WICS) Hub was established to facilitate and provide collaborative opportunities for IANR faculty to leverage their individual and collective knowledge, talents, and interests to drive impact in Research and Discovery, Teaching and Learning, Extension and Outreach.

This past year we focused on building connections as well as identifying and prioritizing big challenges and opportunities facing Nebraskans. The faculty identified and organized around the following themes, Digital/Precision Agriculture, Soil Health, Integrated Cropping Systems, Water Quality, and Water Quantity. The Theme Groups are faculty led and multi-disciplinary with representation across IANR Departments and Faculty appointments.

We welcome you to join us in our journey to drive collective impact in Research, Teaching, and Extension by joining us for the 2022 WICS Conference. The desired outcomes for the conference are:

- Create awareness of innovative research, extension, and teaching efforts, along with regional and statewide needs
- Provide opportunities for information exchange between specialists, educators, research and teaching faculty
- Facilitate integration of research information and extension programming at the State and Regional scale

We thank the planning committee who spent countless hours making this conference come to life – Chris Proctor, Nebraska Extension Educator; Tamara Jackson-Ziems, Professor and Nebraska Extension Specialist; Nathan Mueller, Nebraska Extension Educator; and Crystal Powers, Nebraska Water Center Research and Extension Communication Specialist. A special "Thank You" goes to Alisa Kushner, WICS Hub Coordinator, who has very efficiently kept things moving along with short timelines.

We hope that you take advantage of the Conference collaborations and continue to grow the connections you have made.

Have a great conference!

Daran and Daren
WICS Program Leaders

2022 WICS Conference Agenda

Lincoln, NE – Graduate Hotel

November 30, 2022

9:00 AM - Registration, Coffee, and Poster Setup

10:00 AM - Welcome and Introduction

- Welcome and IANR Hub Overview – Mike Boehm
- WICS Hub Vision and Introduction – Ron Yoder
- WICS Conference Overview – Daren Redfearn and Daran Rudnick

10:30 AM - Research Overview, Panel, and Discussion

- Opening Comments and Panel Moderator – Archie Clutter

- Research Insights and Panel Discussion
    - Soil Health – Michael Kaiser
    - Water Quantity – Trenton Franz
    - Water Quality – Dan Snow
    - Digital/Precision Ag – Yeyin Shi
    - Integrated Cropping Systems – Nicolas Cafaro La Menza
    - Ag Economics – Taro Mieno
    - Integrated Crops and Livestock Systems – Amy Schmidt

- Collaboration Space: Open Discussion with Integrated Break

12:00 PM - Lunch

1:00 PM - Teaching Overview, Panel, and Discussion

- Opening Comments and Panel Moderator – Tiffany Heng-Moss

- Teaching Insights and Panel Discussion
    - Andrea Basche
    - Saleh Taghvaeian
    - Tamra Jackson-Ziems
    - Don Lee
    - Leah Sandall

- Collaboration Space: Open Discussion with Integrated Break

2:30 PM - Extension Overview, Panel, and Discussion

- Opening Comments and Panel Moderator – Charlie Stoltenow

- Regional Extension Insights
    - Panhandle – John Thomas, Gary Stone, Karen DeBoer
    - Southwest – Chuck Burr, Samantha Daniel
    - Central – Sarah Sivits, Todd Whitney, Ron Seymour, Amy Timmerman
    - Northeast – Wayne Ohnesorg, Bruno Lena, Mitiku Mamo, Luan Oliveira, Nate Dorsey
    - Southeast – Jenny Rees, Steve Melvin, Gary Lesoing, Aaron Nygren, Nathan Mueller

- Statewide Extension Insights and Panel Discussion
    - Soil Health – Katja Koehler-Cole
    - Water Quantity – Xin Qiao
    - Water Quality – Troy Gilmore
    - Digital/Precision Ag – Andrew Little
    - Integrated Cropping Systems – Justin McMechan

4:00 PM - Poster Session and Social

6:00 PM - Dinner on own at local restaurants

December 1, 2022

9:00 AM - Welcome and Day 1 Recap

9:15 AM - WICS Theme Group Discussions with Regional Integration

11:00 AM - Conference Summary and Take-away, Looking Forward

11:30 AM - Lunch

12:00 PM - Theme Group Planning Sessions (Room Available until 5p)

WICS Themes

Digital Ag Integrated Cropping Systems Water Quality Water Quantity Soil Health

Conference Attendees

Guillermo Balboa
Research Assistant Professor Nutrient Management and Digital Ag, Agronomy and Horticulture

Research interest: site-specific crop management, crop simulation models, crop ecophysiology and digital agriculture. Applying agronomic knowledge, soil science, and crop production principles to investigate innovations in farming systems that increase productivity, water, and nutrient use efficiency to achieve sustainability. Integrating the state of the art, field experiments, modeling, and digital agriculture tool.

Andrea Basche
Assistant Professor, Agronomy and Horticulture

Andrea Basche is an assistant professor in the University of Nebraska-Lincoln's Department of Agronomy and Horticulture Department. Her research team studies several aspects of diversified cropping systems including nitrogen and nitrogen cycling, water storage & infiltration, weeds & pests. In her role, she also teaching undergraduate courses in crop management.

Jeff Bradshaw
Professor, Entomology

My research and extension program is focused on agroecology and IPM in sermi-arid cropping systems. Current efforts include: insect management and pollinator conservation in sunflowers, monitoring and biological control of western bean cutworm in dry beans, and wheat stem sawfly management in cereal crops.

Kyle Broderick
Plant Diagnostician, Plant Pathology

I coordinate the UNL Plant & Pest Diagnostic Clinic providing diagnostic support for Nebraskans and shareholders across the United States. Commodity crops make up the bulk of samples received, but we will diagnose any plant health problem with any plant.

Kelly Bruns
Director, West Central REEC

Kelly Bruns serves as the Director of the West Central Research, Extension and Education Center Located in North Platte, Nebraska. Kelly is a Nebraska native and graduate of UNL. He served in a primarily teaching role at SDSU for 18 years before joining UNL in 2014.

Chuck Burr
Extension WICS Educator, Nebraska Extension

I work mostly with promoting the adoption of water quality and water quantity best management practices. I also have an interest in digital agriculture and dealing with limited water supplies.

Nicolas Cafaro La Menza
Assistant Professor, Agronomy and Horticulture

Research focus: The biogeochemical cycles are natural pathways by which essential elements such as carbon, nitrogen, hydrogen, phosphorus, and sulfur circulate in the Earth's ecosystems. The agroecosystems can significantly modify biogeochemical cycles causing water and air pollution and global warming. My long-term research goal is to develop agronomic tools and strategies to improve agroecosystems management productively and sustainably. To achieve that, I study crop nutrient dynamics and resource use efficiency of sunlight, water, and nitrogen to integrate them into the cropping system. In rainfed and irrigated cropping systems with limited water, maximizing crop production and economic and environmental viability has been challenging. For example, cropping systems in the west-central Nebraska area are mostly cereal-based with corn, wheat, and sorghum. Soybean and field peas are two legume crops partially established in the area but with comparatively lower acreage than cereals. Also, the use of cover crops, particularly in irrigated fields, is a developing management practice increasingly adopted. Therefore, I am interested in the role of legumes and biological nitrogen fixation in cropping systems and the impact of cover crops on the nutrient dynamics and nutrient management of the cash crop.

Extension Focus: Through extension outreach, I listen to growers, visit farm and industry operations, identify current and emerging issues in cropping systems to bring these issues to a research program, and provide research-based information to growers to help them with their daily agronomic decisions. It is my goal to help growers improve their crop management practices and profitability while maintaining the farm operation environmentally sound. The west-central region in Nebraska demands research-based information on legume crops such as soybean and field peas, the use of cover crops, and nutrient management.

Gabriela Carmona

Post Doctoral Research Associate, Department of Entomology

I'm a post-doctoral research associate with the McMechan lab. My Ph.D. research was focused on the interaction between arthropods and cover crop management tactics. As a post-doctoral research associate, I'm primarily focused on soybean gall midge, where I lead the efforts to organize a field survey of this new pest in Nebraska. I'm also the lead on several industry trials looking at new and existing chemistries to manage soybean gall midge. Part of my duties includes the translation of the research in the lab to clientele through field days.

Carolina Córdova
Assistant Professor and Statewide Soil Health Specialist, Agronomy and Horticulture

My research/extension work aims to conceptually and experimentally unite soil health and the sustainable intensification of agriculture while studying mechanisms to increase carbon sequestration and reduce farmer reliance on synthetic fertilizers. I strive to integrate agroecological principles, biogeochemistry,

and modeling in my research and teaching to understand soil-plant-atmosphere interactions in important agricultural settings across temporal and spatial scales. Agricultural settings range from low-input and high diversity (e.g., forest, perennial grasses) to contrasting field cropping systems (e.g., cash crops).

Aaron Daigh
Associate Professor of Vadose Zone Science, Agronomy & Horticulture; Biological Systems Engineering

I direct research on vadose zone water quality and the fate and transport of nutrients and chemicals of agricultural landscapes overlying major aquifers. My research and teaching focus intersects with vadose zone hydrology, agricultural water management, water quality, soil physics, contamination and remediation, land reclamation, ecohydrology, diversified cropping systems, and agronomy. I currently teach a course on modeling vadose zone hydrology and plan to offer other courses in the near future.

Samantha Daniel
Assistant Extension Educator, WICS

As a crops educator and entomologist, I am focused on serving the communities of Perkins, Chase and Dundy counties and Nebraskans state-wide through science-based educational programming. Programing topics address issues related to integrated pest management, precision agriculture and water quality and conservation.

Karen DeBoer
Extension Educator, NE Extension

100% Extension appointment serving the southern panhandle region with a home office in Sidney (Cheyenne County). Dryland cropping systems focus with the main emphasis in pest management in rotations where winter wheat is the main crop.

Rhae Drijber
Professor, Soil Microbial Ecology Department

The focus of our research is to identify patterns and processes of soil microbial communities important to plant productivity and health, soil carbon sequestration and ecosystem sustainability. Our approach describes and quantifies the spatial and temporal dynamics of soil microbial communities as they exist in situ in natural and managed ecosystems using biochemical, enzymatic and molecular approaches. Key projects include assessment of arbuscular mycorrhizal fungal diversity and function in agricultural and natural ecosystems, identifying underlying microbial processes linked to C and N cycling in maize cropping systems subjected to varying N fertilizer input and management, and the impact of climate change on microbial function, specifically litter decomposition, nutrient cycling and soil organic matter storage, as well as plant-microbe interactions essential to plant productivity. I also teach a senior undergraduate and graduate course in Soil Microbiology (AGRO 460/860) and guest lecture in several courses and extension events on topics related to soil microbial ecology in agroecosystems, soil carbon dynamics and mycorrhizal symbiosis with plants.

Tom Franti
Extension Specialist & Associate Professor, Biological Systems Engineering

My R/T/E is related to surface water quality in both agricultural and urban areas. I am currently working on BMPs recommendations to control ephemeral gully erosion. I am involved in urban storm water management Extension. I teach courses on NPS pollution control and ecological engineering.

Troy Gilmore
Associate Professor, School of Natural Resources

My research (70%) is focused on the movement of water and contaminant movement in aquifers and streams, with emphasis on novel approaches for sensing our environment. My extension (30%) is focused on translating water quantity and quality studies for use by key decision makers and to increase knowledge among the public.

Erin Haacker
Assistant Professor, Earth and Atmospheric Sciences

I use modeling to assess flux and storage of groundwater, and groundwater-surface water interactions, with a particular emphasis on integrated modeling across disciplines. I teach upper-division water courses including GEOL 488/888 Groundwater Geology, GEOL 372 Water and Earth Connections, and GEOL 988 Groundwater Modeling, in addition to GEOL 106 Environmental Geology.

Derek Heeren
Associate Professor, Biological Systems Engineering

The objective of Dr. Heeren's teaching program is to prepare students to be wise managers of irrigation, water resources, and agricultural systems. He teaches courses in mechanized systems management and agricultural engineering, advises undergraduate and graduate students, and is co-advisor for the Mechanized Systems Management Club. Students working with Derek get hands-on experience with irrigation technology while working with industry partners. Derek recently published a textbook on Irrigation Systems Management, available at https://asabe.org/ism. He also has various leadership roles in ASABE and is the coordinator for the partnership between the Daugherty Water for Food Global Institute (DWFI) and the IHE Delft Institute for Water Education, Delft, the Netherlands. The overarching objective of my research program is to enhance and improve both the sustainability of water resources and the profitability of agricultural production in Nebraska and the Great Plains. Research areas include Sensor-Driven Irrigation Management, Sprinkler Irrigation Systems in Nebraska, Variable Rate Irrigation, Vadose Zone Hydrology.

Tamra A. Jackson-Ziems
Extension Plant Pathologist, Department of Plant Pathology

Corn and Grain Sorghum Diseases. 80% Extension, 10% Research, 10% Teaching

Terry James
Extension Educator, Department of Agronomy and Horticulture

I focus my extension work within the consumer horticulture discipline. This is the art and science of plant cultivation, use, and enjoyment. The programs which I focus on are the Nebraska Extension Master Gardener Volunteer program and Backyard Farmer.

Amit Jhala
Associate Professor, Department of Agronomy and Horticulture

Amit Jhala is an associate professor and extension weed management specialist in Department of Agronomy and Horticulture at the UNL. Before joining faculty position at UNL, he was a postdoctoral fellow at the University of California−Davis and University of Florida. His responsibility in current position is to provide research and extension network for weed control in agronomic crops in Nebraska. His research program is focused on the biology, pollen-mediated gene flow, and management of herbicide-resistant and problem weeds. His lab is investigating chemical and non-chemical weed management programs in agronomic crops. He has secured $7.3 million in his program with $3.2 million as a principal investigator. His list of publication includes 12 invited referred book chapters and 139 peer-reviewed papers published in high impact journals. Extension program is focused on developing a sustainable agronomic crop production system by teaching the principles of safe, effective, and cost-effective weed management. Providing leadership to transfer research-based information to clientele for management of herbicide-resistant weeds. Contributed 138 articles in Crop Watch, 7 NebGuide/peer reviewed Extension Circular articles, 32 Market Journal extension videos, 28 Nebraska Extension Almanac Radio interviews, and 85 interviews with agriculture magazines on variety of weed science research topics. Jhala's weed science extension program reaches several thousand clientele. Organizes Weed Management Field Days attended by 100 to 200 clientele every year. Provides cutting-edge, research-based information by demonstrating trials of new herbicides, multiple herbicide-resistant crops, and how to manage herbicide-resistant weeds. This is the venue through which growers, crop consultants, industry representatives, and Nebraska's commodity board members can rely on receiving unbiased information about weed control in corn, soybean, sorghum, and popcorn. Field Day programs have been highlighted on Nebraska TV with special coverage of the Field Day and an interview. Frequently interviewed for articles in agricultural magazines such as Nebraska Farmer and Corn & Soybean Digest. For more information, http://agronomy.unl.edu/jhala.

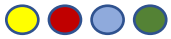
Leslie Johnson
Animal Manure Management Extension Educator, Extension

Leslie Johnson is the Animal Manure Management Extension Educator at the University of Nebraska. She is based at the Haskell Agricultural Laboratory in Concord and has statewide responsibilities. She manages the online manure course and annual manure trainings across the state that meet certification requirements for livestock facilities required to have Land Application Training. She also supports other manure programming in Nebraska as needed and would like to expand her reach to other manure users including smaller livestock producers and crop farmers that are using manure but may not have their own livestock. Her expertise lies in using manure agronomically and she strives to develop different, hands-on ways of teaching materials so that they are easier to learn. She most often works with Javed Iqbal in the Agronomy Department and Amy Schmidt and Rick Stowell in Biological Systems Engineering. Her role also includes facilitating article development for manure.unl.edu and helping with field days associated with on-farm research projects related to manure. Outside of Nebraska, she is actively involved with the

Livestock and Poultry Environmental Learning Community (https://lpelc.org), a national learning community focused on manure and how livestock impact the environment. With that group, she serves as the webinar coordinator among other duties. Additionally, she frequently works with the Soil Health Nexus team (https://soilhealthnexus.org), which is a North Central Region network of extension professionals focused on soil health.

Alisa Kushner 
WICS Hub Coordinator, WICS - IANR VC Office

Alisa's role is facilitating coordination of the WICS Program and members of WICS to help build collaborative relationships and foster engagement within the program.

Andy Little 
Assistant Professor of Landscape and Habitat Management, School of Natural Resources

My research and extension focus is on the conservation adoption in agricultural landscapes via precision conservation. My work focuses on finding innovative land management solutions for farmers/ranchers to optimize production and natural resource conservation.

Arindam Malakar 
Water Center and SNR

Our group focuses on understanding geochemical transformations in the critical zone, which directly influences groundwater quality. The understanding will lead to develop critical zone centric technology to protect water quality.

Mitiku Mamo 
Extension Educator, EZ5

Soil Health: On the soil health side, I collaborate with a research and teaching faculty on a research project titled "Managing Cover Crops to Enhance Soil Ecosystem services in Soils Vulnerable to Environmental Pressures". Vulnerable soils in our case sloping and sandy soils that are susceptible to erosion and nutrient loss through surface runoff and leaching. I manage the site at the Haskell Ag. Lab, one of the three sites and is focusing on sandy soils. The study looks at two planting methods (inter-seeding and drilling), and two cover crop termination dates (early and late).

Groundwater Quality: I am a member of a team of Nebraska Extension and NRDs working on the Bazile Groundwater Management Area (BGMA). The BGMA is predominantly sandy soil that makes it susceptible to nutrient leaching resulting in pollution of ground water. The BGMA was granted funding by NET to establish demonstration and research sites to evaluate various best management practices. Three demo sites were established to evaluate irrigation and nitrogen treatments as well as each site focusing on specific cultural practices. For example, the first site evaluated nitrogen inhibitor, the second site evaluated crop rotations, and the third site evaluated soil health. The BGMA team, helped with collecting field data, organized Field Days, and brought knowledgeable speakers for the winter programs.

Surface Water Quality: The Bow Creek Watershed Project is an NET grant funded project managed by the LCNRD to implement long-term adoption of crop rotations and conservation practices that address water quality, profitability, and sustainability. The main water quality issue is sediments and E-

Coli load in the Bow Creek. I am a member of a group that comprises Extension Educators, Game and Parks staff, NRCS staff, LCNRD staff that meets bi-weekly to discuss BMPs. I have also made presentations on crop rotation benefits.

Dylan Mangel
Extension Plant Pathologist, Plant Pathology

I am an extension/research plant pathologist working on ways to improve soybean yield by decreasing yield loss to disease. Diseases of particular interest are phytophthora root and stem rot and sudden death syndrome. Another primary focus is soybean cyst nematode (SCN). This is the number one biotic yield limiting agent of soybean. We are working on methods to help producers plant more resistant varieties to this pest.

Peter McCornick
Executive Director, Daugherty Water for Food Global Institute (DWFI)

Lead DWFI in delivering on its vision of a water and food secure world, building effective partnerships and collaborations in Nebraska, nationally in the US, and other key food producing regions of the world to develop viable solutions to sustainably managed water for agriculture.

Carla McCullough
Watershed Science Associate Extension Educator Department, SNR

My current position apportionment is 100 percent Extension. My focus has been on producing and promoting the use of educational materials to help Nebraska citizens who manage the state's natural resources. Main topics of these materials have been:

- (Water Quantity) the Integrated Management Planning process between Nebraska's Natural Resources Districts and the Nebraska Department of Natural Resources.
- (Water Quality) Nonpoint Source Pollution (what is it, why and how we manage it), nitrate in groundwater (the issue, the challenge, human health links, how to test your well, rusty pivots).

Justin McMechan
Assistant Professor, Crop Protection and Cropping Systems Specialist, Department of Entomology

Dr. McMechan’s research and extension efforts are focused on a wide range of topics, such as arthropods in cover crop systems, insect-hail interactions, ear formation issues in corn, and a new species in soybean, the soybean gall midge. When an unexpected issue occurs, clientele often look for an acute management practice such as insecticides to reduce yield losses. Dr. McMechan's team focuses on the interactions between insects and managed environments to broaden the management toolbox. His lab utilizes both traditional sampling techniques (pitfall traps, plant collections, sweep nets, and brine extractions) and cutting-edge technologies such as UAV, time-lapse and GoPro cameras. These digital technologies, along with customized graphics, are processed and built within his lab to create standalone products that strengthen communication and dialogue with clientele.

Steve Melvin
Extension Educator, Nebraska Extension

Steve Melvin is an Extension Educator focused on Irrigated Cropping Systems and has thirty-two years of experience in Nebraska Extension. Ten of those years were in the Republican River basin teaching how to optimally use irrigation water during a time when irrigation water allocations where going into effect. He spent five years working in the irrigation industry teaching customers and dealers from around the globe how to best manage center pivots and optimize irrigation water returns. Steve's current Extension programs emphasize water conservation, effective irrigation equipment management, and how water stress at different growth stages affects yield.

Jeremy Milander
Extension Educator, Nebraska Extension

I am the WICS educator for the Bazile Groundwater Management (BGMA) area including parts of Antelope, Knox and Pierce counties in Northeast Nebraska. I work closely with the four Natural Resource Districts (NRDs) collaborating on activities in the BGMA. I focus on educating producers on agronomic best management practices to reduce the amount of nitrate leaching into the groundwater. I am currently working on a collaborative project between UNL and the NRDs with three different demonstration and research sites looking at best management practices to mitigate nitrate leaching. The focus areas of the sites are cropping rotation systems, nitrogen management and inhibitors and soil health.

Nathan Mueller
Water & Cropping Systems Extension Educator for Gage, Jefferson, and Saline counties, Nebraska Extension

Nathan Mueller earned three degrees in agronomy with a PhD from K-State and MS and BS from UNL. He has been a Nebraska Extension Educator for 8 years, a Nebraska Certified Crop Advisor for 7 years and member of the American Society of Agronomy for 17 years. Mueller holds a 100% Extension appointment as a Water & Integrated Cropping Systems (WICS) Extension Educator with an accountability region of Gage, Jefferson, and Saline counties in southeast Nebraska. Mueller's primary responsibilities are developing and delivering WICS extension programming that improves profitability and sustainability of farm operations, reduces environmental risk associated with crop production, encourages stewardship of natural resources; enhances resiliency of cropping systems to extreme weather and climate change, and expands consumer awareness of food, forage, grain, and fiber. Mueller has developed and currently delivers a regional program called Winter Wheat Works Initiative that assists producers and agronomists in eastern Nebraska in diversifying crop rotations with winter wheat to reduce the risks associated with extreme weather, climate change, and other agronomic challenges. Visit Nathan's regional website at croptechcafe.org/winterwheat to learn more. For example, in 2022 he has answered 174 clientele questions on small grains from 31 counties in Nebraska and 2 counties in Iowa. Mueller partnered with Practical Farmers of Iowa to host the 2022 Midwest Small Grains Conference in Lincoln, led the delivery of the 2nd annual Southeast Nebraska Alfalfa & Wheat Expo in Crete, hosted the UNL Agronomy Department Crop Testing Winter Wheat Variety Trial Tour in eastern Nebraska, and partnered in planting a wheat variety strip trial for area farmers. Mueller is a collaborator on a 1.2 million USDA-funded project on precision nitrogen wheat and corn management research. Contact Nathan Mueller at nathan.mueller@unl.edu or 402-821-1722.

Christopher Neale
Director of Research, Daugherty Water for Food Global Institute

Conducting research on the use of remotely sensed imagery from satellite, airborne and unmanned aerial systems to inform models for maintaining a soil water balance and scheduling irrigations on variable rate irrigation equipped center pivots. Also using remote sensing to map wetlands and riparian vegetation, in addition to monitoring crop biomass and yield. Measuring real time evapotranspiration of crops with eddy covariance flux tower systems and providing the data to farmers and water managers through the Parallel 41 Flux Network. Estimating daily evapotranspiration from satellite and working towards testing and improving the accuracy of the spatial product to be used by farmers through an online tool. Measuring all greenhouse gases emitted from typical production fields supplying grain to the ethanol industry along with all necessary ancillary data required to inform life cycle analysis models and estimate carbon capture.

Aaron Nygren
Extension Educator, ENREEC

I am the Crops and Water Extension Educator for Saunders, Douglas and Sarpy Counties. With this role, I focus on meeting the agronomic needs of producers through certifications, on-farm research, and one-on-one consultation. I also serve as the coordinator for Soybean Management Field Days and Crop Management Diagnostic Clinics.

Wayne Ohnesorg
Extension Educator, ENREEC

Nebraska Extension Educator and Entomologist assigned to Madison, Pierce, and Antelope Counties. His areas of expertise center around integrated pest management, insect pest management, insect identification, and mobile scouting tools. Additionally, he is a panelist on Backyard Farmer and delivers commercial, non-commercial, and private pesticide applicator training.

Luan Oliveira
Asst. Extension Educator, IANR

Luan Oliveira is a Water and Integrated Cropping Systems Assistant Extension Educator with 80% Extension Education Appointment and 20% Lead Educator. In the Extension Educator role, Luan works closely with farmers and industry with the main goal of increasing regional awareness and knowledge on best practices for precision agriculture technologies applications and agricultural machinery in. Extension publications, meetings, field days, and social media are also communication tools used to reach a broader audience. Luan is currently conducting extension and research projects including the use of unmanned aerial vehicles (UAV's/drones) in corn and soybeans, by performing one-on-one drone flights and teaching farmers the multiple analysis that can be performed with the different sensors mounted to a drone. Planting technologies evaluation is also part of Luan's program. To increase stakeholders' engagement, Luan started an online and interactive platform called "Smart Machinery" (www.smartmachinery.farm) in which educators with similar backgrounds in precision agriculture, agricultural machinery, and irrigation management can provide online contents in multiple audiovisual formats.

Katie Pekarek 

Extension Educator – Water Quality

Pekarek is an Extension Educator and Biological & Agricultural Engineer working with water quality, watershed management, conservation practices, and agricultural technology demonstration which restores and protects water resources in Nebraska. Highlighted programming efforts include:

- HiCCIP: Highboy Cover Crop Interseeding Project – The purpose of the Highboy Cover Crop Interseeding Project (HiCCIP) is to demonstrate the of broadcast interseeding of cover crops before harvesting corn using a high clearance machine (around R5) and evaluate the effectiveness of the approach.
- Watershed Management Planning Education – working with watershed stakeholders and local decision makers to identify issues of concern in their watersheds and then take steps to restore and protect Nebraska's water resources.
- Nitrate Education Programming – collaborating with Nebraska's agricultural and water management leaders to identify needs and take actions to improve nitrate groundwater quality in Nebraska. This includes facilitating Nitrate Working Groups, developing educational resources for nitrogen certification, and developing community resources for source water protection.
- Liaison with the Nebraska Nonpoint Source (NPS) Program at the Nebraska Department of Environment and Energy (NDEE) – connecting the NDEE NPS program and projects with the breadth and depth of Nebraska Extension
- Watershed Science Education (NebraskaWAVES) – developing online watershed science modules to support natural resources managers and decision makers.
- Nebraska Nonpoint Source Management Plan – developing and maintaining the state plan which guides management actions for nonpoint source pollution remediation activities
- Primary Target Audiences – water management decision makers, rural Nebraska water users, community water systems, producers, agricultural service providers, Natural Resources Districts

Crystal Powers 

Research and Extension Communication Specialist, Nebraska Water Center

My role is to build collaborations between University of Nebraska faculty (UNL, UNMC, UNO, UNK, Extension, DWFI...) and water professionals throughout Nebraska to help ensure our work is meeting the needs of the state. I work to be a trusted communication channel to our external partners: sharing stories of impact, listening to needs and concerns. Then knowing what resources we offer and striving to get the right people at the table to serve the needs of these partners. A large focus over the past several years has been bringing our resources to bear on nitrate: needs assessment, coordination, strategic communications, synthesis, grants advising, conferences, media, and more.

Chris Proctor 

Weed Management Extension Educator, Agronomy and Horticulture

In my role as an Extension educator, I coordinate the Crop Production Clinics. These meetings are conducted across the state in January and provide training for commercial and private pesticide applicators and certified crop advisors. A broad range of disciplines are represented each year that include disease, insect and weed management, application technology, soils, nutrient and water management, and agribusiness management. We are continuously trying to incorporate new and relevant topics and try to innovate our delivery methods to best engage with attendees. My research is primarily focused on

integration of cover crops into Nebraska row-crop systems evaluating weed suppression nitrogen cycling potential. I also am doing work with new technologies evaluating real-time site-specific weed management.

Daren Redfearn 

WICS Program Leader and Extension Specialist, Agronomy & Horticulture

Daren Redfearn is a Professor of Agronomy and Nebraska Extension Forage and Crop Residue Specialist. Dr. Redfearn is a member of a multidisciplinary team focused on enhancing and developing forage-based beef production systems. His research and extension program emphasizes annual and perennial grass management, converting cropland to forage production, and evaluating forages that can be integrated into economical and resilient crop-forage-bioenergy agricultural production systems. He also serves as Program Leader for the Water and Integrated Cropping Systems (WICS) Team co-leading a group of technical experts in water and cropping systems to build collaborative relationships and foster engagement that addresses complex issues in agricultural production and natural resource systems.

Jenny Rees 

Extension Educator, Extension

My Extension work centers around serving Nebraskans with their cropping system questions, particularly around crop physiology, diagnosing crop problems to determine cause, and the integration of cropping systems with livestock and cover crops. I am highly involved with on-farm research to help producers answer their questions with research-based information. Connecting like-minded farmers for support systems and teaching youth to develop life skills in ag are also passions of mine.

John Ruberson 

Professor, Department Head, Entomology

I am 100% administration, but I teach a graduate course in Biological Control of Pests (ENTO 813) annually. I also maintain small collaborative research efforts in biological control of insect pests, ecology of arthropod natural enemies, and insect seasonality in relation to climate change and pest management.

Daran Rudnick 

Associate Professor and Program Leader and WICS Program Leader, Biological Systems Engineering

Daran Rudnick is an Associate Professor and Irrigation Management Specialist in the Department of Biological Systems Engineering. His responsibilities include developing and conducting relevant and responsive water and crop management research and extension programs for Nebraska. Specific interests include full and deficit irrigation management, evapotranspiration, precision water management, fertigation, and plant and soil water monitoring technologies. He also serves as a Program Leader for the Water and Integrated Cropping Systems (WICS) Hub that fosters collaboration across faculty to address complex issues in agricultural production and natural resource systems.

Amy Schmidt 

Associate Professor, Livestock Environmental Engineer, Biological Systems Engineering & Animal Science

Dr. Schmidt leads an integrated research and extension program focused on supporting socially and environmentally responsible livestock production to enhance soil, water, and air quality. Specifically, she assesses and demonstrates the impacts of manure and organic soil amendments on soil physical,

chemical, and biological properties, and related transport of contaminants to surface and ground water. Demonstrating the connection between improved soil quality and improved water quality is a primary focus of her current outreach efforts. In response to worldwide concerns about antibiotic resistance, she also collaborates across disciplinary boundaries to understand manure management practices that can mitigate the transport of antimicrobial resistance mechanisms in the environment originating from land-applied livestock manure. She leads a nationwide outreach program called the iAMResponsible Project, conducts AMR-related research, and teaches a graduate-level course titled "Antimicrobial Resistance from a One Health Perspective," which connects students across multiple disciplines and academic institutions in learning about their individual and collective roles in mitigating AMR. Her desire to train the "next generation" of extension engineers and water quality specialists is the basis for her unique approach to engaging undergraduate and graduate students in both research and the delivery of evidence-based recommendations and education through extension programming.

Ron Seymour
Extension Educator, Zone 10

Cropping systems extension in Adams, Webster, Kearney and Franklin Counties. Teach pesticide safety, and pest management for farmers. Conduct on-farm research on crop production questions. Development of prairie strips at Nebraska research facilities to provide farmers a site to demonstrate the value of crop adjacent native habitat. Assist with the development of prairie habitat in riparian areas. Monitor the interactions of arthropods in field crops as affected by adjacent prairie habitat. Evaluate the effect of long term cover crop on soil health.

Yeyin Shi
Assistant Professor, Biological Systems Engineering

Dr. Yeyin Shi is currently an assistant professor of agricultural information systems in the Department of Biological Systems Engineering at the University of Nebraska-Lincoln. Her research program aims to develop and apply advanced and emerging sensing and information technologies, as well as state-of-the-art data science and AI techniques, to generate, gather, and analyze data for decision makings in row crops, rangeland, and natural resources management. A significant source of information in her research is the data generated by unmanned aircraft systems (or drones) and satellites. She and her colleagues also go beyond sensing but incorporate sensing and actuation for intelligent aerial applications. Dr. Shi is also passionate about college education and has been part of the thrust in the development of precision and digital agriculture curriculums.

Sarah Sivits
Extension Educator, Dawson County Extension

Focus efforts are in on-farm research, integrated pest management, pest identification, crop scouting, and working with the NE Women in Ag program.

Daniel Snow
Laboratory Director and Research Professor, Nebraska Water Center and School of Natural Resources

Director of Water Sciences Laboratory, Part of the Nebraska Water Center and Daugherty Water for Food Global Institute. Research Professor (10% Teaching, 45% Research, 45% Service). Teaching: Water Quality Strategy, Environmental Laboratory Methods. Research: Environmental Analytical Chemistry and Mass

Spectrometry, Chemistry of Pesticides and Emerging Contaminants, Water Quality, Nitrate Fate and Transport, Stable Isotope Mass Spectrometry, Bioremediation.

Gary Stone
Extension Educator, Biological Systems Engineering

Assist Dr. Xin Qiao with the continued development of the PHREEC Irrigation and Digital Ag Lab water management web site. Work with John Thomas, Extension Educator, with on-farm dry edible bean research variety trials, nitrogen rates, and direct harvest. Produce weekly crop water use (ET) numbers for the various Panhandle crops during the growing season to assist growers with efficient irrigation management. Conduct and teach private, commercial / non-commercial, and chemigation applicator pesticide safety training. Assist Dr. Bijesh Maharjan with the soil health workshop for the Panhandle. Conducted or assisted with various extension workshops, meetings, and publications including CropWatch, 4H, Nebraska LEAD, international students at the PHREEC, and the Yonts Water conference. Authored a "Water Law 101" and "North Platte River - Multi-use Water" series for CropWatch and other news outlets. Part of the Nebraska Extension Disaster Education Network (EDEN), Nebraska Invasive Species Council, and the Radiation Safety officer for the PHREEC neutron probes. Am a Certified Professional Agronomist and Certified Crop Advisor under the American Society of Agronomy.

Saleh Taghvaeian
Associate Professor, Biological Systems Engineering

My position apportionment is 60% Research and 40% Teaching, focused on irrigation and drainage engineering, including system design, system management, irrigation scheduling, and irrigation-induced water quality.

John Thomas
Crops and Water Extension Educator, UNL Extension

My current research is focused around on farm research looking at dry edible bean harvest method (direct harvest), varieties, populations and row spacing, and nitrogen fertilization. We have incorporated time lapse photography, satellite imagery, drone imagery and prescription/ variable rate fertilizer applications in our work. In addition I am actively involved in pesticide education and applicator recertification classes including chemigation. I am involved in 4-H programs with the kids as well youth agricultural safety education. I regularly answer clientele questions on agriculture, lawns and gardens, trees, insects and almost any subject you can think of.

Amy Timmerman
Extension Educator, Extension - Engagement Zone 2

I am based out of O'Neill, NE covering the north central counties of Nebraska in Integrated Cropping and Water. My extension focus is around integrated pest management with a primary focus in plant pathology. I also work closely with five Natural Resource District on water quality issue in particular nitrates. The primary focus on nitrates is in the Bazile Groundwater Management Area located in Antelope, Knox and Pierce Counties.

Kim Todd
Professor/Extension Specialist, Agronomy and Horticulture

My teaching and extension appointments focus specifically on the practical application of the science and art of the landscape as a whole system, regardless of size and location.

Dan Uden
Assistant Professor, School of Natural Resources; Department of Agronomy and Horticulture

I study spatial resilience, including critical transitions, in working agricultural landscapes. I teach about ecosystems of the Great Plains, landscape ecology, and research in grasslands.

Yvon Ukwishaka
Graduate Research Assistant, School of Nature Resource

I am interested in the individual and collective effects of publicly and privately provided risk management tools as well as the influence of technology on agricultural producers.

Cory Walters
Associate Professor, Agricultural Economics

I am interested in the individual and collective effects of publicly and privately provided risk management tools as well as the influence of technology on agricultural producers.

Stephen Wegulo
Professor/Extension Plant Pathologist, Department of Plant Pathology

I conduct research on diseases of wheat, specifically Fusarium head blight (FHB). I also collaborate with the small grains breeder to screen wheat and barley lines for resistance to FHB, stem rust, and leaf rust. My extension activities include participation and presentations in crop production clinics and wheat field days and dissemination of wheat disease management information through the CropWatch newsletter and news media interviews. I conduct annual wheat disease surveys to determine which diseases are occurring in growers' fields. Information from the surveys is disseminated to growers, crop consultants, educators, and the public through CropWatch and helps growers make informed, timely decisions on management of diseases in their wheat fields.

Todd Whitney
Cropping Systems, Soil Health & Water Educator, Agronomy

Todd Whitney is a Cropping Systems, Irrigation and Soil Health Extension Educator based in Holdrege. Todd's primary accountability counties include: Furnas, Gosper, Harlan and Phelps county along with statewide Manure TEAM support. Educational focus topic include: Soil Health; Cover Crops; Irrigation ET & Nitrogen Risk Management within the Tri-Basin NRD and Lower Republican NRD. On-Farm research projects have included: variable rate nutrient management; manure/wood chips studies; soybean management; UNL Wheat Performance Testing; pivot compaction; and UNL crops-related special project studies.

Robert Wright
Professor and Extension Specialist, Entomology

Research/Extension appointment in agronomic crop insect management, primarily in corn and soybean. Applied research studies conducted at South Central Ag Lab and other locations across state. Contribute to Crop Production Clinics, Soybean Management Field Days, ENREC Crop Clinics and CropWatch website. Teach Management of Agronomic Crop Insects (ENTO 825) in support of UNL Entomology online MS program. Mentor graduate students and Doctor of Plant Health students.

Qiuming Yao
Assistant Professor, School of Computing

Dr. Qiuming Yao is an assistant professor in School of Computing UNL. Dr. Yao holds dual degree in Computer Science and Biostatistics and is specialized in omics integration in bioinformatics and computational biology. Dr. Yao leads the Integrated Digital Omics Lab (IDOL). His lab is interested in developing scalable algorithms, tools and databases to integrate different types of high throughput omics data to understand dynamic and complex biological systems. Dr. Yao has been developing plant and microbe software and databases for a decade. Dr. Yao has the long term vision of integrating omics data to drive data-centric discovery and engineering for improving our environment and health as a safe, secure and precise technology.

Sarah Adam
Research Technician, Plant Pathology

Mahnoor Asif
PhD Student, Plant Pathology

Pratiksha Baishya
Graduate Research Assistant, Agronomy

Ally Barry
Student, Environmental Studies

Roberta Bianchin Rebesquini
Master's student, Agronomy & Horticulture

Ann Briggs
PR and Engagement Coordinator, NE Water Center

Jose Cesario Pinto
Ph.D. Student, Agronomy

Ankit Chandra
Research Program Manager, Daugherty Water for Food Global institute

Victor de Sousa Ferreira
Master's Student, Department of Agronomy and Horticulture

Xiaochen Dong
PhD Student, School of Natural Resources

Nate Dorsey
Extension Educator, WICS

Jamie Duan
Ph.D. student, Biological Systems Engineering

Bruno Eltink
Intern, Department of Agronomy and Horticulture

Rana Farrasati
Graduate Student, Agronomy and Horticulture

Jessica Garcia Nascimento
Post Doc, DWFI

Loren Giesler
Professor and Head, Plant Pathology

Pragya Gupta
M.S. Student, Graduate Research Assistant, Department of Entomology

Alyssa Hall
Graduate Student, Department of Agronomy and Horticulture

Rachael Herpel
Assistant Director, Daugherty Water for Food Global Institute, Nebraska Water Center

Leonardo Inveninato Carmona
Research, Department of Agronomy and Horticulture

Jay Jenkins
Engagement Zone Coordinator, Extension

Michael Kaiser
Assistant professor for Applied Soil Chemistry, Department of Agronomy and Horticulture

Pratibha Karki
Student, Plant Pathology

Abia Katimbo
Incoming Assistant Professor, Biological Systems Engineering

Makki Khorchani
School of Natural Resources

Katja Koehler-Cole
Extension

Ishani Lal
Graduate Research Assistant, Agronomy & Agricultural Economics

Meghan Langel
Director of Operations | Water, Climate and Health Program at UNMC, Environmental, Agricultural & Occupational Health, College of Public Health, UNMC

Bruno Lena
Assistant Extension Educator, ENREEC

John Lindquist
Professor, Agronomy and Horticulture

Mitch Maguire
Research Associate, Daugherty Water for Food Global Institute

Martha Mamo
Head, Agronomy and Horticulture

Asha Mane
Graduate Student, Plant Pathology

Talon Mues
Research Technician, Plant Pathology

Chikoti Mukuma
Plant Pathology

Mohammad Omar Faruk Murad
Biological Systems Engineering

Laura Nagengast
Source water protection extension educator, SNR

Hope Njuki Nakabuye
Biological Systems Engineering

Jose Cesario Pinto
Ph.D. Student, Agronomy

Martha Rhoades
Research Manager, SNR

Andrea Rilakovic
PhD student, Entomology

Renata Rimsaite
Senior Program Manager, Daughter Water for Food Global Institute

Camila Rodrigues
Research Scholar, Agronomy & Horticulture

Kayla Safarik
Graduate student, Agronomy and Horticulture

Arshdeep Singh
Graduate Research Assistant, Agronomy & Horticulture

Mandeep Singh
Graduate Research Assistant, Agronomy & Horticulture

Shiv Singla
Graduate Research Assistant, Plant Pathology

Ian Tempelmeyer
Graduate Research Assistance, Biological Systems Engineering

Christopher Termunde
Graduate Research Assistant, Plant Pathology

Natasha Umezu
Graduate Research Assistant, Department of Entomology

Christian Uwineza
Graduate research assistant, Agronomy and Horticulture

Larry Van Tassell
Department Head, Agricultural Economics

Thiago Vitti
Agronomy and Horticulture

Jennifer Weisbrod
Pesticide Safety Education Program Coordinator, Agronomy

John Westra
Director, Panhandle REEC

WICS Poster Submissions

Water Quantity

Irrigation-as-a-service for smallholder farmers

Ishani Lal

Irrigation is one of the key crop management practices that can help increase food security among smallholders globally while mitigating climate change impacts. However, high productivity and efficient irrigation technologies such as drip kits and sprinkler systems are expensive, and smallholders cannot afford them to buffer crop yields against low precipitation. In many underdeveloped countries, farmers participate in robust informal markets for renting and sharing irrigation equipment. Such services may be operated by farmers or via a third-party such as irrigation start-ups, water users associations, non-governmental organizations, or government agencies. These markets are referred to as irrigation-as-a-service (IAAS). The objective of this study is to develop and analyze the decision-making model for IAAS. A decision-maker must choose an optimal strategy of how to provide occasional and mobile irrigation service across multiple possible fields to irrigate when there are constraints of time and water availability that prevent all fields from being irrigated fully. Our results showed that decision-making under IAAS is complex, with possible solutions where all, some, or only one field is irrigated depending on key parameters. We used a crop water production function that established a mathematical relationship between crop yield and variable irrigation water inputs for a given set of climate conditions and farm management practices. We analyzed how the optimal irrigation service strategy varies as a function of field-level parameters (soil type, crop type, and field size), regional parameters (weather), physical parameters (pump and pipe capacities), and economic parameters (fuel cost, labor cost, and crop prices).

Canopy temperature based irrigation water management of maize in semi-arid environments

Hope Njuki Nakabuye

The increase in crop canopy temperature is a plant physiological response to water stress and can be utilized in irrigation management. Canopy temperatures are often used to compute thermal indices that are indicative irrigation application trigger points. The use of the thermal indices is however hampered by variation in crop stress baselines as well as thermal thresholds which are dependent on crop type, local climatic characteristics, and agronomic practices. It is therefore important to conduct site specific experiments to determine how best measured canopy temperatures can be incorporated in irrigation management. A study was conducted at the West Central Research, Extension, and Education Center in North Platte, NE to evaluate the thermal response of maize grown under three water treatment levels namely: full irrigation (100% FIT) rainfed (0% FIT), and deficit irrigation (60% FIT). Additionally, the Degrees Above Non-Stressed Canopy (DANS) index was also used in the real time irrigation scheduling of a separate infrared thermometry based irrigation treatment (IRT treatment). The canopy temperatures were measured using stationary infrared radiometers (Apogee instruments Inc., Logan, UT, USA) and following data quality control canopy temperature values 2 hours after solar noon were used in irrigation scheduling procedure. Results showing the DANS baseline development, as well as differences in crop response between the 0% FIT, 60% FIT, 100% FIT, and the IRT treatments will be presented.

Water Quality

Water Sciences Lab - University of Nebraska – Lincoln
Ann Briggs

The Water Sciences Laboratory's mission is to provide technology, expertise, services, and training in advanced analytical science supporting today's water and natural resources students, researchers, and stakeholders. The Lab is part of the Nebraska Water Center. The Water Sciences Laboratory provides standardized and custom-application analytical testing for water, wastewater, and sediments designed around academic researchers and clientele within the private sector. Faculty involved in water quality and related research can utilize the lab for sample testing.

Nebraska WAVES - Information for managers of Nebraska's natural resources
Carla McCullough

The Nebraska WAVES program provides information for citizens who manage Nebraska's natural resources. The program has produced videos, storymaps, interactive modules and other virtual educational materials about water quality and quantity for surface water and groundwater. Nebraska's Natural Resources Districts have locally-elected boards and have significant management responsibilities for water management across the state. In the initial phase of program development, Nebraska WAVES has worked primarily on outreach to these boards with the goal of helping providing the information they need to make sound, science-based decisions for the long-term health, community vitality, and economic prosperity of Nebraskans.

Nebraska Water Center & Daugherty Water for Food Global Institute
Crystal Powers

The Nebraska Water Center (NWC) & Daugherty Water for Food Global Institute (DWFI) are here to help faculty build connections and impact. NWC hosts the semi-annual Water Resources Advisory Panel to inform the university of stakeholder needs. It has representation from multiple sectors: governmental (local to federal), NGO, agriculture commodity, engineering firms, water management (irrigation & utilities), and university administration. We also report out at many of the stakeholders events: leadership meetings, conferences, etc. We share out stories of faculty research through our newsletter, seminars, conferences, tour. Then we convene specific meetings with the faculty based on the needs. Some recent examples: State-wide Nitrate working groups, Bazile Groundwater Area group, corn fertilizer working group, and more. We also work internally: hosting faculty retreats to prepare for grants, participating in ARD, ORED discussions, providing insights as needed across the faculty.

Agrichemical Mixtures in Drinking Water Samples Collected for the Birth Outcomes and Water Study

Martha G. Rhoades, Kara J. Kniep, Carolyn D. Billings, Troy E. Gilmore

Background: Fertilizer and pesticides are an integral part of modern agriculture, but they can have serious side effects on agricultural producers, their families, and their communities. Nitrate contamination of Nebraska drinking water supplies is well documented, but we have limited information about the co-occurrence of nitrate with other agrichemical compounds. This study quantified 34 agrichemical compounds in 32 drinking water samples collected for the Birth Outcomes and Water (BOW) study. Methods: Nitrate (NO3-N), nitrite (NO2-N), 21 parent pesticides, and 11 pesticide transformation products were measured in water samples collected from BOW participants' residences. Compounds with the potential to react with nitrite (reduced from nitrate) and form N-nitroso compounds after ingestion are of specific interest to the BOW study.

Results: Nitrate-N was detected in all water samples and 14 samples had detectable nitrite-N. Eight transformation products and 10 parent pesticides were detected with pesticide transformation products detected more frequently than parent pesticides. Nitrate-N and at least one other agrichemical compound were detected in 97% of the water samples, 82% had five or more, and 57% of the water samples contained 9-12 contaminants in addition to nitrate-N.

Conclusions: Study findings can help prioritize agrichemical mixtures for establishing human-health benchmarks and help direct future groundwater monitoring efforts and resource management. Co-occurring contaminants should be considered when evaluating linkages between exposure to agrichemicals through drinking water and poor health outcomes. Chronic, low-dose exposure to multiple compounds may have separate biological effects on health outcomes when compared to single compounds.

Site-Specific Evaluation of Nitrogen Inhibitors on Corn Yield, Soil Nitrate and Ammonium, and Water Nitrate Concentration

Christian Uwineza

Nitrogen (N) is globally used to improve corn production and maximize yield and profit. Despite its role in increasing yield, over application of N has caused environmental issues including contamination of ground water and an increase in greenhouse gas emissions. Nitrogen inhibitors are chemical products designed to inhibit specific pathways of the N cycle that could lead to N losses, developed to increase N use efficiency (NUE) and reduce N loss to the environment. To understand the effectiveness of N inhibitors and their impact on corn production and the environment, we tested two nitrification inhibitors Pronitridine (Centuro) and a mixture of dicyandiamide and N-(n-butyl) thiophosphoric triamide (NBPT) (Redstar) in two commercial farms in Nebraska during 2022 growing season. Our objectives were to quantify the variability of yield, NO3-N concentration in soil water, and analyze the dynamics of soil nitrate and ammonium for with and without N fertilizer on on-farm research studies within different soil textures. when using N inhibitors. Lysimeters were installed eight days after N application at 1.22 m depth. Water samples were collected from lysimeters once a week or a day after a rain or irrigation event to estimate N leaching. Biomass samples were collected at R1 and R6 to measure N uptake. Yield was collected using a combine monitor during crop harvest. Results show that N inhibitor treatment resulted in yield increase in both sites ($p<0.05$). In site II, N inhibitor produced 670 kg ha^{-1} more grain. There was no treatment effect on soil lysimeter water NO3-N and soil nitrate and ammonium concentration at both sites. Understanding

the benefits of N inhibitors will contribute to the reduction of N losses and improve N availability for crop use during the growing season.

Soil Health

The impact of nitrogen rates across sites and years on intermediate wheatgrass grain yields: A meta-analysis

Roberta Bianchin Rebesquini

Intermediate wheatgrass (Thinopyrum intermedium), recognized under the trade name Kernza® by The Land Institute, is a cool-season low-input perennial grass that can be managed to produce grain and biomass, while providing desired environmental benefits such as soil conservation and nutrient cycling. Although prior research with intermediate wheatgrass has answered initial questions about its management and benefits, it has also found different fertility responses in different years of Kernza development, challenging farmers to determine nutrient needs from season-to-season. We are conducting a meta-analysis of N rate studies with intermediate wheatgrass to determine rate effects on yields, forage, and biomass across different years of the crop's development. Through a literature review, using "kernza" or "intermediate wheatgrass" or "Thinopyrum intermedium" and "nitrogen" or "nitrogen rates" key words, we found 10 studies that fit our criteria, where different nitrogen rates were used on intermediate wheatgrass to evaluate yield or forage components. At least two nitrogen rates will be evaluated in each study, where a control rate (0 kg N. ha^{-1}) will be compared to a higher rate, depending on each study. Preliminary analysis indicates that optimal N rates differ between the years of the intermediate wheatgrass stand, offering potential insight into the crop's changing nutrient needs.

Evaluating Greenhouse Corn Preemergence Herbicide Carry-Over Potential to Interseeded Cover Crops

Victor de Sousa Ferreira

The adoption of cover crops as a strategy to improve soil health and cropping systems sustainability is on the rise in the United States. The application of PRE herbicides with soil residual activity is commonly used in corn production systems in order to reduce early season weed establishment and minimize crop-weed competition and yield loss. Active ingredients from preemergence herbicides, when sprayed on the field, remain in the soil rhizosphere for a period of time killing weed seedlings as they emerge. However, PRE herbicides can also impact the establishment of interseeded cover crops. The main objective of these studies is to elucidate the impact of corn PRE herbicides on cover crop establishment and to identify the ideal time to interseed cover crops following herbicide application. For both experiments, PRE herbicide treatments consist of atrazine + S-metolachlor + bicycloprione + mesotrione (Acuron), acetochlor + mesotrione + clopyralid (Resicore), and saflufenacil + dimethenamid (Verdict). For the dose response experiments, six rates (1x, 0.8x, 0.6x, 0.4x, 0.2x and 0x relative to herbicide label recommendation) are being evaluated whereas for the timing of establishment following application, the 1X label rate is being evaluated. Bioindicator species being evaluated in this study include hairy vetch, cereal rye, winter wheat, radish, red clover and annual rye as cover crops, and Palmer amaranth and giant foxtail as weeds. Biomass reduction compared to the control will be presented and used to estimate the time required from herbicide application until cover crops can be safely interseeded.

Controlling Nitrate Leaching in subsoil with Woodchips Injection

Xiaochen Dong

Due to intensive agricultural activity, drinking water is widely contaminated by nitrate, which is the most common contaminant affecting groundwater quality in the U.S. Nitrate leaching is most associated with areas with sandy well-drained soils and shallow water table, as well as an aerated unsaturated zone. Nitrate is easily soluble in the water and quickly leaching down to the deep soil, denitrification and plant uptake are two main processes affecting the nitrate removal in subsoil. Denitrification bioreactors is one of the recently developed technologies for practical field nitrate removal. Currently a few exist bioreactor projects are established to control nitrate leaching in agricultural areas. But few researchers are working on a large-scale management. This study will focus on establishing a biologically active layer for removing dissolved nitrate on a large-scale basis as well as bench tests to evaluate the best carbon sources as bioreactor.

Greenhouse Evaluation of Corn Preemergence Herbicide Carryover Potential for Early-Season Drill Interseeded Cover Crops

Bruno Eltink

Cover crops can improve soil health and benefits are related to biomass production, however, the growing season in Nebraska is limited. Therefore, early-season drill interseeding is a potential solution, as it allows the cover crops a wider window for growth. Preemergence (PRE) herbicides are important in corn production. Nonetheless, residual herbicides can impede the growth of cover crops. The main objectives of this study were 1) elucidate the impact of corn PRE herbicides on cover crop establishment and 2) determine the optimal interval between herbicide application and cover crops seeding. A greenhouse bioassay was conducted to evaluate the effect of PRE herbicides on cover crops and weeds. Herbicide treatments were Acuron at 5.84 L ha^{-1}, Resicore at 5.84 L ha^{-1}, Verdict at 0.58 L ha^{-1} and a non-treated control. The cover crops were planted at 0, 7, 14, 21, 28, 35, 42, 63 and 70 days after treating (DAT). The species used were hairy vetch, cereal rye, winter wheat, radish, red clover and annual rye (cover crops), and Palmer and giant foxtail (weeds). Above-ground biomass was collected. Preliminary results showed that all herbicides maintained 100% of weed control up to 21 DAT. Biomass production increased when planted 21 DAT for the Acuron treatment on winter wheat and cereal rye, for winter wheat following Resicore treatment and cereal rye, red clover and hairy vetch biomass increased for the Verdict treatment. Results suggest it is possible to select an herbicide that provides adequate weed suppression while still allowing interseeded cover crops establishment.

Soybean Cyst Nematode (Heterodera glycines Ichinohe) Virulence Assay Against Resistance Sources in Nebraska

Pratibha Karki

Soybean cyst nematode (SCN), one of the major yield limiting pathogens of soybean, is currently found in 59 counties of Nebraska that produce more than 93% of the state's soybean. Often, yield loss occurs without any above-ground symptoms, which makes it difficult to manage. The primary management option is the use of SCN resistant varieties. There are several soybean plant introductions that serve as resistance sources against SCN. Unfortunately, the single source, PI 88788, is used in approximately 95% of resistant varieties. Past studies have found that the prolonged use of PI 88788 has increased the virulence status of SCN. The objective of this study is to assess the virulence status of Nebraska SCN

populations on resistant varieties. To complete this objective, we will survey Nebraska soybean fields, test for SCN, and conduct virulence tests against known resistance sources with the SCN populations. Results are likely to show that, with the continued use of PI 88788, SCN virulence has continued to increase on the resistance source. To increase the lifespan of deployed resistance genes, it is necessary to rotate resistance sources. This study aims to increase the number of Nebraska producers who use effective management practices against SCN.

Alfalfa in annual crop rotation reduces the risk of nitrate leaching

Arshdeep Singh

Alfalfa (Medicago sativa L.) in rotation with annual crops possesses the potential to decrease nitrate-nitrogen (NO3-N) in the vadose zone and enhance soil organic carbon (SOC) sequestration. This study aimed to evaluate the effect of long-term alfalfa rotation on soil organic carbon, NO3-N, ammonium-nitrogen (NH4-N), and soil water at 7.2 m depth. Six pairs of continuous corn and alfalfa rotation plots were examined. The soil samples were collected from 0 – 7.2 m (entire core) depth and analyzed at 0.3 m increments. Alfalfa rotation had 65% higher SOC at 0.15m depth. Alfalfa rotation decreased nitrate amount by 457 kg ha^{-1} and soil water by 36% at the 0-7.2 m. The cropping system did not affect NH4-N in soil. Neither cropping system nor NO3-N concentration affect NH4-N in the vadose zone. The higher reduction of soil water below the corn root zone in alfalfa rotation suggests that (i) soil water availability for corn is not impacted, and (ii) nitrate leaching potential is reduced due to less deep percolation. In summary, the results from this study indicate that including alfalfa in rotation can significantly reduce the risk of nitrate leaching to groundwater and increase the potential of soil surface carbon sequestration.

Digital/Precision Agriculture

Dashboard for Agricultural Water Use and Nutrient Management

Guillermo Balboa

The Dashboard for Agricultural Water Use and Nutrient Management (DAWN) is an online toolkit for row crop producers in the US Corn Belt that is designed to support – and better inform – common field-level decisions related to water- and nutrient-management. DAWN's suite of tools is driven by a state-of-the-art regional forecast system that empowers farmers to make decisions based on accurate seasonal forecasts instead of historical trends. The DAWN team is composed of research and extension scientists from the University of Maryland, the University of Illinois Urbana-Champaign, the University of Nebraska, Colorado State University, and the University of Minnesota, as well as agricultural analysts from the Family Farms Group. DAWN is also working with a diverse network of agricultural stakeholders to guide the direction and development of its products. DAWN available tools are the Crop Progress Tool and the Growing Degree Day Outlook Tool. Tools coming soon: Dry Down Calculator, Yield Estimates, Nitrogen Cost, and Irrigation Schedule Tool. Driven by forecasts from the National Oceanic and Atmospheric Administration (NOAA). DAWN provides two scales of forecasts: seasonal (for annual planning) and short-term (for real-time operation). All data is fully secure and confidential, cost-free and no ads.

UNL-Testing Ag Performance Solutions (UNL-TAPS): Five Years of Impact and Engagement and a Look to the Future

Chuck Burr

Nebraska Extension initiated a Farm Management Competition in 2017 to encourage the adoption of technology and management practices improve efficiency and profitability. The program has expanded to six competitions in Nebraska and Oklahoma with participation from four states and over 160 total participants. TAPS personnel have written 4 peer-reviewed journal manuscripts, 5 peer-reviewed extension and education publications, 47 audio and video appearances and 71 printed articles and reports. Monetary donations have totaled over $78,000, equipment and service donations over $659,000 and over $1.2 million in research grants. Practice adoption by participants will be reviewed as well as a look to the future of what TAPS might look like in 2027.

Modeling Winter Wheat Yield and Protein to N with APSIM Next Generation

Jose Cesario Pinto

Crop modeling and precision ag technologies hold potential benefits for winter wheat production. However, the development and testing of this technology require intensive data collection, crop sampling, and soil sampling procedures built into a comprehensive, multi-year field experiment. Our project aims to a) characterize the yield response to N, yield and protein at the EONR, and yield with no N for two winter wheat cultivars in Nebraska, b) quantify differences in crop dynamics between two winter wheat cultivars and N rates, and c) Test the performance of APSIM next generation simulating winter wheat in Nebraska. A field trial was established at the South Central Agricultural Laboratory – University of Nebraska, NE, in 2020-2021. The study was set up in a randomized complete block design with two wheat cultivars (LCS Valiant and WB4699), four N rates (0, 50, 100, and 150 kg N ha^{-1}), and three replications. Biomass samples were collected at different growth stages (green-up, jointing, booting, flowering, harvest) for C/N analysis. Other measurements include soil moisture (watermark sensors at 0.3-0.6-0.9 m), weather data, soil NO3-/NH4 (0-20, 20-40, 40-60 cm) over four times in the season, test weight, grain protein, and grain yield. A hydraulic probe collected post-harvest soil sampling involving root depth determination and soil collection from 1.2 m depths. We will test the initial performance of the APSIM next generation for a better understanding of the cultivar-specific dynamics and estimate the ability of the APSIM model to predict yield and biomass accumulation across NE. The EONR was different between winter wheat cultivars. N uptake at the dough stage and physiological maturity differed significantly between cultivars at N150. Future modeling work will aim to capture cultivar-specific differences to inform N recommendations in winter wheat.

Development of fertilizer recommendation system for oil palm smallholders based on artificial intelligence and smartphone applications

Rana Farrasati

Indonesia is known as the major producer for world's palm oil, with 14.72 million ha area dominated by private (53%), smallholders (41%), and public-owned (6%). Recent research explained we face serious issues of high yield gap in smallholders fields caused by nutrient imbalance, limited knowledge-farmers' education about best management practices (BMP), and expensive cost of fertilizer recommendation for farmers. To address this issue we build an information system that generates a fertilizer recommendation application with management practices suggestions based on the field, climate condition and farmers'

yield. The application named as Oil Palm Assistant (OPA) which made by Indonesian Oil Palm Research Institute and supported by The Indonesian Palm Oil Plantation Fund Management Agency. The data collection are processed with expert systems, crop and nutrients modeling, and machine learning with artificial neural network analysis for predicting the yield. The input data for farmers are total area, number of trees per hectare, yield, palm age, soil type, topography, and location for geotagging with NASA Power rainfall data. We developed DRIS concept and nutrient balance to obtain the fertilizer dosage based on the farmer-reported data. The proposed features from this application are farmer's field dashboard that consist of yield and income tracking, yield prediction, fertilizer recommendation, rainfall, leaf chlorophyll, and nutrient status, and educational notes for BMP that promotes land intensification and sustainability. Currently, the beta version of android app is and the web app (https://urldefense.com/v3/__http://www.opa.co.id__;!!PvXuogZ4sRB2p-tU!F0TlYZWxKmmHuUuugbRD9QSnweAhMD4JV0zGIAj5sMYxKFIpGVWjOhWsBUBZFEBYHnR77bo_Xzs0dfZMpA$) are established. Moreover, the data validation and improvement of system precision are still on going.

Automated and Intelligent Irrigation Scheduling using Big Data from Dense Wireless Sensor Networks

Abia Katimbo

Expansion of irrigated crop production has created more pressure on groundwater with increasing withdrawals and deteriorating water quality from nitrate leaching, particularly in intensively managed agricultural farmlands and in regions with high irrigated acres like Nebraska. Therefore, application of reliable decision support tools which optimize irrigation applications are desired with ability to detect water stress and irrigation amount estimates in real-time and in accurate manner. Developed low cost sensors when employed can either measure crop water status or soil moisture to aid irrigation scheduling. Such sensors are either mounted stationary or on mobile sensing platforms (Unmanned Aerial Vehicles (UAVs)/ center pivots/ high clearance tractors). Furthermore, coupling different sensors provide multiple data as "big data" which can provide more insightful information for better irrigation prescriptions. Among the data types include multispectral and thermal imagery as well as point-based data including canopy temperatures, soil moisture, and weather parameters. Wireless sensor networks enable all these data to be synched together and collected in real-time fashion while using designed sensor nodes and gateways. Additionally, combination of "big data" and machine learning techniques might provide precise irrigation recommendations as compared to conventional methods which might use single data type. The poster will highlight different ways of collecting big data in agricultural fields and their potential use in automated and intelligent irrigation scheduling.

Novel Commercial Farm-Field Network to Quantify Emissions and Carbon Storage from Agricultural Bioenergy Feedstock Production

Mitch Maguire

This project provides innovation and impact through novel data collection, data utilization, multi-disciplinary stakeholder partnership, and community engagement across energy-water-food nexus pathways to establish and monitor emissions at the field level. These pathways create co-benefits to monitor greenhouse gas emissions, while simultaneously delivering critical agronomic insights to farmers and water quality assessment data and supporting rural economies through bioenergy market development. These data also connect across a broader set of organizations within agricultural supply chains, conservation organizations, additional government entities, academic organizations, and the

broader public. In turn, this project is critical in accurately quantifying environmental, production and economic impacts of commercial feedstocks for bioenergy production and optimizing decisions to meet bioenergy, environment and rural community goals at the same time.

Promoting Adoption of Precision Nitrogen Management Technologies through On-Farm Research

Laura Thompson

The Nebraska On-Farm Research Network helps farmers evaluate products and practices that impact the productivity, profitability, and sustainability of their operations. There are many technologies that have potential to increase nitrogen use efficiency (NUE) on corn and winter wheat but typically these technologies have low adoption. At the same time, farmers have technologies such as GPS, yield monitors, and variable-rate application equipment on their farmers that enables them to easily conduct on-farm research to evaluate new technologies and products. Participating farmers evaluated commercially available nitrogen management technologies across Nebraska and their impact on yield, profit, and NUE. We enable farmer's hands-on experience with technologies that are relevant for their operation and promote technology adoption. We also collect field data to validate and improve the technology tested. 40 trials are established each year in the three year project. We utilize an innovative experimental design combining traditional strip trials with small N plots where all treatments are established with variable-rate fertilizer equipment on-the-go. An automated data processing tool was developed for data processing, analysis, and reporting. 98% of the experiments were successfully established in the first year of the study and 90% were analyzed using the automatic process. To measure impact, grower incremental changes and adoption are documented.

Targeted Weed Management: Challenges and Opportunities

Thiago Vitti

Site-specific weed management (SSWM) focuses on bringing together diverse technologies to manage the weeds where they are. Identification and separation of crop plants and weeds is key to successful implementation of SSWM. Many technologies have already been developed such as sensors (e.g., UAV and sprayer mounted), complex algorithms, and machine learning. The increasing public scrutiny about food security and growing regulatory pressure worldwide concerning herbicide use in the agricultural food chain has created a need for change in conventional agricultural systems. The development of SSWM tools that rely on spot spraying, robotic weeding, and/or precision mechanical weed control will help alleviate these pressures. These tools will impact agronomics, economics, and the environment of row-crop systems.

Integrated Cropping Systems

Effects of Fungicides and Cultivar Resistance on Fusarium Head Blight of Wheat

Mahnoor Asif

Fusarium head blight (FHB) results in considerable yield and economic losses worldwide. Additionally, the pathogen produces the mycotoxin deoxynivalenol (DON), which is harmful to humans and animals. The objective of this study is to evaluate the effects of fungicides and cultivar resistance on FHB. In 2022, a

field trial was conducted at an irrigated site at the Havelock Research Farm in Lincoln, Nebraska. Two cultivars, an FHB moderately resistant cultivar, Zenda, and a susceptible cultivar, Wesley, were subjected to nine fungicide treatments including the untreated check. The treatments consisted of two fungicides, Sphaerex (triazole) and Aproach (strobilurin), each applied at different combinations of three growth stages (Feekes 6 (Fk6), Fk9 and Fk10.51). Due to dry weather conditions, FHB, DON, and FDK developed to low levels. FHB index did not differ (P = 0.05) between cultivars or among fungicide treatments. DON and FDK were significantly higher in Wesley but did not differ among treatments. In Zenda, FDK differed among treatments and ranged from 10% (Sphaerex Fk9 + Fk10.51) to 29% (Aproach Fk6 + Fk10.51). Overall, treatment with Approach resulted in 30% higher DON compared to Sphaerex. Yield did not differ among treatments in either cultivar. Test weight was higher in Zenda than in Wesley but did not differ among treatments in either cultivar. The results from this study indicate that less DON and FDK developed in Zenda than in Wesley, and a triazole fungicide was more effective in reducing DON and FDK than a strobilurin fungicide.

Executing a Multi-Institution Cover Crop Challenge Activity

Andrea Basche

Cover crop mixtures have increased in use and interest across the United States, and future agriculture professionals benefit from exposure to selection and management considerations. In a newly developed cover crop management course, executed concurrently at six Land Grant Universities, students engaged in a "cover crop challenge" to optimize the growth and diversity metrics of a cover crop mixture. In this poster, the instructors will describe how the activity was executed and lessons learned from the first year of execution. In 2021, 97 graduate and undergraduate students participated in the challenge, including activities woven throughout the semester. Beginning in week two, students were tasked with selecting a mix of at least two cover crops species from a set of twelve potential species. Students then converted the same seeding rate to plant their experiments in an indoor greenhouse pot as well as a five foot square area at a field site in their respective locations. In week eight, students harvested cover crop biomass while taking measurements of roots, weeds, pollinators, earthworms, and more. After biomass was dried and weighed, students responded to a series of questions assessing their selection and observations. Overall results were addressed during a remote synchronous multi-site session, and top performers were determined for indoor and outdoor biomass, species evenness and efficiency (most biomass per seed cost). After the first year's successful implementation, in 2022, we will assess student learning outcomes, and hypothesize students will gain skills and confidence in cover crop species selection, seed costs and planting, and experimental design. These management skills support professionals who are competent in diversified management systems that support soil conservation.

Integrated Cropping Systems

Kelly Bruns

The West Central Research, Extension and Education Center is located at 402 West State Farm Road, North Platte, NE. The REEC site in North Platte has seven specialists and 40 staff to support the work at its sites. The North Platte location sites on 1,800 acres of 200 acres are dedicated to rain fed research and another 200 for irrigation research with 40 acres subsurface irrigation. There is 1200 acres of range land and capabilities to measure individual intake on 200 head of cattle. The Water Resource laboratory is located at two sites north and south of Brule Nebraska where irrigation and cropping systems work is conducted in a limited rainfall area. The site has five irrigated pivots four of which have Variable Rate irrigation

capabilities. The Henery J Stumpf International Wheat Center is located in Grant where a focus on cropping systems is conducted with a focus on wheat. The Gudmundsen Sandhills Laboratory is located northeast of Whitman Nebraska and is a 12,800 working ranch where cattle and pasture management studies are conducted. Opportunities to conduct research and host educational programs are available at all locations.

Influence of Cover Crop Planting and Termination Dates on Arthropods in the Following Corn

Gabriela Carmona

Cover crops (CC) can attract both pest and beneficial insects. The abundance and impact of these arthropods to a subsequent cash crop depend on a number of factors, such as CC biomass production and weather conditions. Information about CC planting and termination dates as a strategy to increase beneficial arthropods or suppress pests in the following corn is limited. A two-year field study was conducted at the Eastern Nebraska Research and Extension, NE in 2018/19 and 2019/20 as a split-plot randomized complete block design. The objective of the study was to determine the impact of CC planting date and termination timing relative to corn planting as a source for arthropods on the subsequent corn. The treatments consisted of (i) four whole plot CC planting dates; and (ii) two split-plot CC termination dates. Plots with no CC were used as controls. Five pitfall traps and cover crop biomass were taken during the cover crop season and early corn stages. Corn damage assessments were made at V3 and V6 corn stages to identify pest pressure. A total of 40,904 and 54,053 arthropods were collected in the first and second year. A CC planting date x Sample interaction was significant for total arthopod activity in both years. Higher Araneae and lower Arcari and Collembola were found in treatments with more CC biomass. The results of this study contribute to identifying the best CC management strategy to maximize beneficial insects and minimize pest problems, contributing to a more sustainable agricultural system.

Larval distribution of soybean gall midge in soil from infested soybean plants

Mikaelison da Silva Lima

The soybean gall midge (SGM) Resseliella maxima Gagne (Diptera: Cecidomyiidae), was recently identified as a new past of soybean. Adults lay eggs at the base of the stem where the larvae feed, resulting in a dark discoloration of the stem. Mature larvae exit the stem and form cocoons in the soil. Since this insect was recently identified, much of the biology and ecology of SGM are still unknown. As a result, a two-year field study was conducted in Lancaster County, NE, to understand the movement of SGM larvae from a host plant prior to pupation. The study consisted of two soybean rows, 30 meters long, planted parallel to the field edge and adjacent to another site that was infested with SGM the previous year. No soybean or other plants were present perpendicular to these two rows for 6.5 meters. Soil samples were collected at set intervals in both directions from the soybean rows. The number of larvae and cocoons were isolated using a brine extraction technique. In 2020, results showed the presence of cocoons up to three meters away from a soybean row. Far less movement was observed in 2021. These results increase our understanding of SGM larval movement under field conditions as well as the potential limitations of evaluating adult emergence from small plot research.

Influence of fertigation scheduling methods with and without cover crops on nitrogen use efficiency

Jamie Duan

Excessive nitrogen fertilizer is one of the dominating sources of agriculture contamination, which further affects groundwater quality. A joint study was conducted between the University of Nebraska-Lincoln in partnership with the four Nebraska Natural Resource Districts to improve the nitrogen use efficiency to control groundwater contamination and sustain food production in Nebraska. The field study site was established near Creighton, NE, to investigate the influence of different fertigation scheduling methods on nitrogen use efficiency. Specifically, four treatments were included: laboratory-based (lab-based) fertigation, sensor-based fertigation, lab-based fertigation with cover crop interseeding, and sensor-based fertigation with cover crop interseeding. Lab-based fertigation was determined by the fertigation recommendations from a commercial lab using historical yield records, soil residual nitrogen and other credits; whereas, the sensor-based fertigation was driven by the plant growth status. The recommended fertilizer application was split into four events. Sensor-based treatments were triggered when the, Normalized Difference Red Edge (NDRE) fell below a designated sufficiency threshold. Nitrogen use efficiency (NUE) was computed with total biological yield, soil residue, and application records. Arable Mark 2 sensors (Arable Labs, San Francisco, CA, USA) were installed in the treatment plots to collect micro-weather and plant response data for use in monitoring crop growth and predicting nitrate leaching. Soil water content was measured by TDR315 (Acclima, Meridian, Idaho, USA) and neutron gauge (InstroTek Inc, Raleigh, NC, USA) to estimate the nitrogen leaching process. The comparison of NUE with plant and soil responses under different fertigation scheduling methods will be presented.

Hilling as a Cultural Control Strategy for Soybean Gall Midge

Pragya Gupta

Soybean gall midge (SGM) Resseliella maxima Gagne is a recently identified species causing significant injury to soybean, and it is currently found in 140 counties across five midwestern states (NE, IA, SD, MN, and MO). Infestation of soybean begins in late spring when adults emerge from last year's soybean field. The successful infestation of a new soybean crop appears to be dependent on the development of fissures at the base of the soybean plant that occurs around the V2 stage. Field observations indicate that these fissures are only present below the cotyledonary node or an area within 3-5 cm above the soil surface. To determine the importance of these fissures, hilling or ridge tillage was applied to soybean at the V2-V3 stage, covering the fissures with soil. Field studies were conducted at three locations in east-central Nebraska. Results showed a significant reduction in larval number per plant, frequency of infested plants, and plant injury for hilled compared to unhilled plots. These results highlight the importance of fissures for adult infestation as well as the potential for ridge tillage or hilling to be used as a management strategy for SGM.

Grazing in Western Corn Belt Cropping Systems Does Not Reduce Grain Production

Alyssa Hall

Diversified crop, forage, and livestock systems are assumed to be more sustainable and economically competitive than traditional cropping systems through improved climate resiliency and agricultural productivity. Objectives of this study were to determine effects of integrating grazing livestock into corn-soybean (C-S) and corn-soybean-wheat (C-S-W) cropping systems on plant population, grain yield, and soil nitrogen, organic carbon, and carbon dioxide flux following winter grazing corn residue and an oat cover

crop planted after wheat. For the 2019 and 2020 production seasons, neither corn nor soybean plant populations were different in the grazed or non-grazed treatments for the C-S and C-S-W rotations. During 2021 in the C-S rotation, soybean plant populations were greater in the grazed corn residue treatment (319,556 plants ha^{-1}) compared to the non-grazed corn residue treatment (286,520 plants ha^{-1}). Despite the differences in plant population, grazing corn residue and the oat cover crop had no impact on grain yield of soybean and corn in C-S or C-S-W or wheat grain yield in C-S-W. Similarly, for both cropping systems, carbon dioxide flux was not different for either the grazed or non-grazed corn residue or the oat cover crop in any year of the study. Data from this partial evaluation of livestock grazing effects on grain yield suggested no reduction in plant population in cropland grazed during winter with no apparent negative effects on either grain production or soil carbon dioxide flux.

Evaluating establishment and weed suppression potential of early-season drill interseeded cover crops into corn

Leonardo Inveninato Carmona

Herbicides are the most utilized tool to control weeds in row-crop systems. Expanding weed control methods, cover crops are being utilized as an integrated weed management strategy to control herbicide-resistant weeds and improve agricultural sustainability. However, winter cover crop into corn-soyben cropping systems in Nebraska is challenging, particularly given the short growing window between cash crop harvest and cover crop planting. Drill interseeding cover crops during early corn vegetative stage (e.g., V3) is an alternative solution to provide cover crops additional growing season and potential weed suppression. The objective of this study was evaluate the potential of drill interseeded cover crops to suppress weeds and the effect of pre-emergence herbicide application on cover crop establishment. Research was conducted in an on-farm research study near Creighton, NE. Cover crop treatments were a mixture of Hairy vetch (Vicia villosa Roth) and Winter Wheat (Triticum aestivum). Cover crops were planted in field-length strips and paired with a no-cover-crop control. Within the cover crop and no-cover-crop strips, herbicide treatments were applied to small plots and included premixes of s-metolachlor + mesotrione+ bicyclopyrone (Acuron Flexi) and saflufenacil + dimethenamid-P (Verdict). Cover crop biomass was collect at V8 corn stage, before harvest and before first frost killing. Results from V8 sampling time cover crop biomass show no difference between no-herbicide treatment and Verdict treatment. However, was 40% reduction in cover crop biomass with Acuron Flexi treatment compared to no herbicide treatment. No herbicide cover crop treatment resulted in 100% weed control.

DNA-based assay for rapid detection of QoI (Strobilurin) fungicide resistance in plant fungal pathogen Cercospora sojina

Asha Mane

Fungal pathogen Cercospora sojina causes frogeye leaf spot (FLS), a foliar disease of soybean. Over the last five years, yield loss due to FLS in the northern U.S. have more than tripled, going from 0.7 to 2.2 million metric tons. In 2019, QoI fungicide resistance was detected in 111 Cercospora sojina isolates from 10 Nebraska counties. To understand the prevalence of resistance, we expanded this survey in 2020 and amassed a collection of 375 isolates from 48 counties throughout the soybean producing region in Nebraska. A preliminary plate-based assay suggested that QoI fungicide resistance is now widespread, but the results required confirmation with molecular genetic analysis. A major limitation of this approach is that the plate-based assay takes more than two weeks to conduct, requiring isolation of the fungus from leaves, followed by inoculation on fungicide-amended petri-plates and growth-based assays in the lab.

Although platforms exist to enable rapid, in-field detection of mutations, no such diagnostic tool has been developed for detection of QoI resistance Cercospora sojina. To fill this gap, we developed a DNA-based assay for rapid detection of QoI fungicide resistance in Cercospora sojina that utilizes a highly sensitive isothermal DNA amplification method based on ligation-rolling circle amplification. A single reaction can detect three possible mutations (G143A, F129L, G137R) in the cytochrome-b gene that confer resistance. Mutations can be detected directly from infected leaf samples in just 2-3 hours. Rapid detection of fungicide resistance allows timely response by producers to mitigate yield loss.

Foliar fungicide use for soybean disease management across crop reporting districts in Nebraska

Asha Mane

Fungicide resistance is a growing concern in Nebraska. In 2020, widespread Group 11 QoI (formerly Strobilurin) fungicide resistance in Cercospora sojina, causing frogeye leaf spot, was reported in Nebraska yet little is known about how the decision to apply foliar fungicides is made. A survey was conducted in 2021 to understand how farmers perceive foliar fungicide use for soybean disease management in Nebraska. We received 1054 completed responses representing 84 Nebraska counties . Over 90% of crop consultants and agriculture business representatives recommended a fungicide application while 63% of farmers/producers applied foliar fungicide on soybean at least once in the last 5 years. The fungicide application use varied by USDA NASS crop reporting district: East central (72%), Northeast (69%), South central (60%), Southeast (58%), Central (52%), and Southwest (49%). The most cited source of information used to make disease management decisions was recommendations from the local agricultural co-operative service providers followed by University Extension. Factors that influenced application decisions were disease severity, fungicide cost, and crop market value. Although fungicide mode of action was considered important by ag business representatives and crop consultants, soybean farmers/producers ranked it to be the least important factor while making fungicide application decisions. Collectively, these results suggest that Extension programs should continue to appeal to a broad audience and consider how to better target co-operative service providers if we are to promote sustainable use of fungicides and integrated disease management strategies.

Characterizing the distribution of a newly emerged pest, the soybean gall midge across is geographic range and host plants

Justin McMechan

Soybean gall midge (SGM) Resseliella maxima Gagné, was identified in 2019 after reports of widespread injury to soybean in Nebraska, Iowa, South Dakota, and Minnesota. Heavily infested fields in east central Nebraska reported yield losses of 17-31%, with the majority of injury occurring near the field border. In 2019, SGM was confirmed on sweet clover and alfalfa. This project aims to characterize SGM spatial and host plant distribution in Nebraska through a field survey that recorded larval abundance and plant injury to identify the possible abiotic factors that could impact risk. In 2020, infested soybean and sweet clover samples were collected from fields across 39 counties in eastern Nebraska. Up to three infested soybean and sweet clover stems were collected per location from and near to soybean fields. Information regarding the adjacent field crop, developmental stage, and injury at the field border, as well as 15 meters and 30 meters from the border, were recorded. Stems were dissected to count white and orange larvae per stem, which were preserved for further studies. Results from 2020 suggest that the distance of the

sampled field from the nearest dense vegetation and the previous year's soybean field are potential factors for increased soybean plant injury, and a high density of soybean fields is a potential factor for greater larval number. These results will help soybean farmers and researchers understand what factors increase the likelihood of soybean gall midge presence or injury in the Midwest.

Integrated Cropping Systems

Nathan Mueller

Extension personnel need hail-related information they can deliver to clients and stakeholders through multiple platforms: websites, blogs, social media, video, audio, and print. These resources need to appeal to all types of learners, and they must be developed with the targeted audience's limited time in mind. Consumers information need resources they can read, watch, and/or listen to quickly, so they can move into the decision-making phase confidently and in a timely manner. The Hail Know project was developed to build upon and expand hail-related work and programs from Nebraska Extension. The Hail Know team worked with Jacht Ad Agency, the student-run advertising agency managed by the UNL College of Journalism and Mass Communications, to develop an identity package that would be used throughout our developed products. Six videos were created to provide a brief overview of each stage of the hail recovery decision process. The Hail Know team drafted scripts and worked with IANR Media at the University of Nebraska – Lincoln to produce videos designed to engage the audience and provide a brief look into each stage of hail recovery. Infographic content was developed by the Hail Know team. Jacht Ad Agency designed the infographics, which is incorporated into the website, on print materials, and in our social media toolkit. The website is designed to be easy to navigate and mobile friendly. Users will be able to quickly access related research publications, infographics, and a three-minute video. The website is a part of CropWatch at cropwatch.unl.edu/hailknow

Tar Spot: Another threat to Nebraska's corn crop

Talon Mues

Tar spot, caused by Phyllachora maydis, is an aggressive fungal disease that has progressed across the state of Nebraska since 2021. As of the 2022 growing season, the disease was located in 31 Nebraska counties and spreading as far west as Merrick and Knox counties. The characteristic disease symptoms are black stromata that are embedded in the leaf tissue causing the unique black specks or "tar spots". These fungal structures will overwinter in Nebraska and release spores that can lead to repeated disease development whenever favorable weather conditions occur. In 2021, tar spot was the most damaging disease of corn across the United States having an estimated loss of over 200 million bushels. For the Midwest, yield losses of up to 50% have been seen in worst case scenario environments with a susceptible hybrid and severe disease, caused by highly favorable weather conditions. Favorable conditions of prolonged leaf wetness and cooler temperatures can allow for severe disease and yield loss to occur. These favorable conditions of wet periods inside the crop canopy may be bolstered by overhead sprinkler irrigation. It is of concern that frequent overhead irrigation will promote development of tar spot. More research on disease management strategies and pathogen biology is a focus for the future of corn pathology in the Midwest.

Identification of pathogens associated with Crown Rot of corn

Chikoti Mukuma

Corn is one of the most important cereal crops produced in the USA with the corn industry estimated at $64bn. Production of corn in the USA is affected by many factors including diseases. Recently, crown rot disease in corn has emerged as a potential production constraint. Although the primary causal organism of crown rot in corn is not yet known, studies have shown that most crown rot diseases involve fungal complexes acting by themselves or in association with other microbes. In order to understand crown rot in corn, there is need to first identify the primary organism(s) responsible for this disease. In this vein, classical fungal culturing methods, conventional Polymerase Chain Reaction (PCR) and Next Generation Sequencing (NGS), will be used in identification of the primary pathogen(s) causing crown rot of corn in Nebraska and the corn belt in the USA. A total of 120 Samples were collected between 2021 and 2022 in Nebraska and the corn belt in the USA. Using classical fungal culturing methods, a total of 1256 fungal isolates were recovered from the samples. Preliminary morphological identification based on colony morphology, conidia and conidiogenous cells resulted in classification of 90% of the recovered isolates as Fusarium spp. while the remaining 10% consisted of isolates of Pythium spp., Rhizoctonia spp., Macrophomina spp. and other unidentified fungi. Identification of a primary pathogen associated with crown rot in corn will provide information to help direct formulation of accurate crown rot of corn disease management strategies.

Does Planter Downforce and Speed Affect Corn Emergence? What are the impacts?

Luan Oliveira

A planter row-unit is responsible for opening the furrow, metering the seeds, delivering the seeds into the furrow, and closing the furrow to provide optimum seed-to-soil contact. Since seed germination starts with the uptake of water by the seeds from the soil, there's always a need for testing multiple planter settings in a single field to verify which planter calibration will perform better in the sense of providing the best environment for the seed's germination (seed-to-soil contact) and deliver the best seedling emergence and plant stand. The objectives of this study were to verify if corn emergence is affected by planter's downforce settings and displacement speeds, and if the delayed emergence impacted corn ear length width. The trial was performed at a commercial field near Macy, NE. A 24-row John Deere ExactEmerge™ Planter with active hydraulic downforce system was used to perform the planting. Treatments were 3 planter speeds (5, 6, and 7 miles per hour (mph)) and 3 downforce loads (100, 150, and 200 lbs.). The design was a random complete block with four replications. The first plant emerged 11 days after planting. The number of plants emerged in the first 48 hours was significantly decreased when planting at higher speeds (8mph) and using higher downforce (200 lbs.). The same combination between high speeds and downforce showed an increase trend of plants emerging after 48 and 96 hours. The ear length and width were smaller on plants that emerged after 96 hours compared to 0-48, and 48-96 hours.

Comparison of Aerial and Chemigation Insecticide Applications for Western Bean Cutworm Management

Andrea Rilakovic

Western bean cutworm (WBC) is an insect pest that can cause severe damage on corn ears by larval feeding. Inadequate insecticide application may lead to failures WBC control in corn. Exposing this moth to sublethal dosages may cause insecticide resistance. Thus, good coverage of treated plants should be

the goal of pesticide applications. Most growers apply insecticides by airplane in intensive corn production, but spray coverage is not uniform. However, some growers apply insecticides by irrigation system (chemigation), but there is limited information for chemigation efficacy, particularly against this pest. Therefore, the goal of this study was to determine which application method would provide better insecticide efficacy for WBC management. Experiments were conducted in a spray chamber where first, second and third instars of WBC were exposed to the highest and lowest label rates of Brigade (bifenthrin) and Prevathon (chlorantraniliprole). Carrier volume for aerial application was 2 gallons per acre, while for chemigation was 0.25 ac-in. After spraying, 20 neonates or 10 second/third instars were transferred to each Petri dish (four replicates per treatment). Mortality was recorded 16 and 24 hours after infestation. Larvae that did not move for at least body length after gentle prodding with a paintbrush, were considered dead. Overall, results showed that areal application provided better WBC control than chemigation. Within chemigation, Prevathon treatments were effective at both rates for all instars, while the high rate of Brigade provided better control than the low rate. However, Brigade treatments are not effective as they used to be.

Evaluating the weed suppression potential of spray-on biopolymer-based films for use in Midwest Row-Crop Systems.

Camila Rodrigues

Effective weed control can be a major challenge in row-crop production due to widespread herbicide resistance and the need to develop innovative tools for managing these hard to control weeds is increasing. A spray-on biopolymer-based film (biofilm) is a novel weed management tool and has potential to be used in Midwest row-crop systems as an alternative to conventional herbicide applications. The objective of this study was to determine the potential of biopolymer-based films to suppress weeds and the potential for crop injury applied at different timings following crop planting. Greenhouse trials were conducted at the University of Nebraska Lincoln to test three biofilm rates (2, 4, and 8 L m^{-2}) at three application timings relative to the crop stage (at planting, crop emergence - VC, and two true leaf - V2). Four plant species were evaluated Palmer (Palmer amaranth), velvetleaf (Abutilon theophrasti), soybean (Glycine max), and corn (Zea mays) planted in 100 cm^2 pots with 4 replications. Biofilm treatments were applied using a graduated cylinder and evenly poured over the potting soil. Data were collected for above-ground dry biomass and the number of emergence plants per pot. The 8L m-2 biofilm rate resulted in the greatest reduction in biomass across the three applications timings and for all plant species when compared to the other biofilm rates. The results suggest the potential for biopolymer-base film mulch as alternative weed control tool if sprayed at higher rates regardless of application time. Additional Index Words: Biodegradable, Sustainability, Biofilm, Weed suppression, Palmer amaranth

Evaluating drill interseeded cover crop in corn across different rates of dimethenamid-P + saflufenacil applied preemergence

Kayla Safarik

Cover crops can improve soil health, including structure, infiltration, water holding capacity, nutrient cycling, and many other benefits. There has been increased interest in interseeding cover crops with the primary goal of weed suppression to reduce herbicide costs and to manage resistant weeds. Research has shown that interseeded cover crops can suppress weeds by competing for resources (i.e. water, nutrients, sunlight) and decrease germination due to cover crop biomass residue in following crops. For some growers, establishing a cover crop early may be beneficial and more practical for their operation, by

allowing for increased grazing since additional biomass can be produced. Establishing cover crops in the North Central US following corn or soybean may be difficult as the growing season following crop harvest and before crop planting is short. Drill interseeding allows cover crops to be planted early in the growing season (V3-V5) before canopy closure, allowing the cover crop to successfully establish and accumulate biomass. Interseeding after the crop has established minimizes impact on yield and allows cover crop growth before the crop canopy closes. Effective weed control remains a challenge in interseeded corn and herbicide carryover injury is a primary concern where residual herbicides are utilized as they may prevent interseeded cover crops from establishing. Following interseeding of a diverse cover crop mixture, there are no viable weed control options that will not harm an actively growing cover crop. Developing an effective herbicide program for interseeded cover crops into a corn cropping system is challenging as some residual herbicides can have a negative effect on cover crop germination and establishment. The objective of this research was to evaluate the establishment of early-season drill interseeded cover crops across different herbicide rates. Research conducted in Nebraska and Wisconsin applied three rates (365.3 mL ha^{-1}, 730.6 mL ha^{-1}, and 1,095.9 mL ha^{-1}) of saflufenacil plus dimethenamid-P as a premix applied PRE followed by a POST application of glyphosate and glufosinate at V3-V5 corn growth stage prior to cover crop interseeding. Visual weed control ratings, weed counts, weed biomass, and cover crop biomass were collected prior to interseeding, at the corn V8 stage, and prior to harvest. Cover crop biomass data sampled at the corn V8 stage was highest for the burndown only treatments. The 365.3 and 730.6 mL ha^{-1} rates produced similar cover crop biomass but were lower than the biomass produced at the 1,095.9 mL ha^{-1} treatment. For cover crop biomass sampled prior to corn harvest, the 730.6 mL ha^{-1} treatment produced the greatest biomass followed by the 1,095.9 mL ha^{-1} and 365.3 mL ha^{-1} treatments while the postemergence only treatments produced the lowest biomass. Results would suggest that the rate of saflufenacil plus dimethenamid-P had minimal effect on interseeded cover crop establishment, but resulted in more effective weed suppression than the glyphosate plus liberty treatment by the end of the growing season. More research is necessary across multiple environments to ensure effective weed control with PRE and POST herbicides that still allow for the establishment of interseeded cover crops.

Integrated herbicide-resistant weed management

Mandeep Singh

Weeds are mostly controlled using herbicides in agronomic systems. Therefore, herbicide-resistant crops were widely adopted, as they made weed control easy and economical. However, growers over-relied on herbicides such as glyphosate, which lead to the occurrence of glyphosate-resistant weeds. Moreover, weeds are increasingly becoming resistant to multiple other herbicides. This requires the implementation of integrated weed management practices to reduce the evolution of herbicide-resistant weeds. Presently, various weed management practices such as scouting fields, ensuring weed-free fields before planting, using multiple modes of action of herbicides at recommended/labeled rates and weed growth stage, and using biological, cultural, and mechanical practices are recommended. With the advancement in technology, modern technologies are available to diversify weed management in the coming years. Sensor-based technologies such as remote sensing, drones, and precision sprayers can help in weed mapping, scouting, and site-specific weed control. Heat-based technologies such as electrocution and flame weeding can help in controlling escaped and early-established weeds, respectively. Harvest weed seed control helps in decreasing weed seedbank and is being adopted by growers. Crop improvement through gene editing, stacked herbicide resistance, and RNAi technology holds great potential for improving weed control. Overall, it is challenging to manage herbicide-resistant weeds, but they can be effectively managed with the integration of new technologies with previously available weed control solutions.

Constitutive expression of SbCCoAOMT in the phenylpropanoid pathway can improve resistance to Fusarium head blight of wheat

Shiv Singla

Fusarium head blight (FHB) of wheat is caused by the devastating pathogen Fusarium graminearum, which can contaminate grain with the mycotoxin deoxynivalenol. To sustainably manage FHB, it is important to identify novel mechanisms of resistance to F. graminearum. Lignin, a product of monolignol biosynthesis in phenylpropanoid metabolism, rigidifies cell walls and may be a barrier to pathogen infection and spread. In sorghum, altered expression of some monolignol biosynthesis genes was shown to improve resistance to some Fusarium spp. Our goal was to determine if constitutive expression (CE) of the sorghum genes SbC3'H (coumaroyl shikimate 3-hydroxylase) and SbCCoAOMT (caffeoyl coenzyme A 3-O-methyltransferase) in the moderately susceptible spring wheat line CB037 improves resistance to FHB. In the greenhouse, Type II resistance (to pathogen spread) was determined on two CE lines for each gene and CB037, using the area under the disease progress curve (AUDPC) and Fusarium-damaged kernels (FDK). The CE line CCoAOMT413 had the lowest AUDPC and FDK as compared with the CE line, CCoAOMT421, both C3'H CE lines and CB037. RNA sequencing of F. graminearum or mock point-inoculated heads of CB037 and both SbCCoAOMT CE lines at 12 and 72 hours post inoculation (hpi) was performed. Principal component analysis showed that expression varied the most according to time-point then according to treatment and line. At 12 hpi, no mutually-expressed genes were significantly (p-value > 0.05) differentially regulated in the SbCCoAOMT CE lines as compared with CB037 (the recipient line). At 72 hpi, 474 mutually-expressed genes were significantly upregulated (p-value $\leq$ 0.05) in the SbCCoAOMT CE lines. Gene ontology (GO) enrichment included GO terms for chitin metabolism, regulation of jasmonic acid pathway, and defense response that might be associated with the observed moderate resistance in CCoAOMT413. Phloroglucinol staining of F. graminearum-inoculated rachis samples at 72 hpi showed that CCoAOMT413 was more darkly stained compared to CB037 and CCoAOMT421, indicating increased lignin accumulation in CCoAOMT413. We are examining targeted secondary metabolite accumulation in SbCCoAOMT CE and CB037 lines. Results from this research can be used to identify targets for development of novel resistance to FHB.

Crown Rot of Corn A Disease of Growing Concern

Christopher Termunde

Crown rot of corn (Zea mays) is a disease that is of growing concern in Nebraska and across the Corn Belt of the United States. At this time the pathogenic organism of this disease is not known. Symptoms observed in the field includes early rapid senescence, also known as ghosting as the plants often change color to pale green to gray. Splitting stalks longitudinally through the crown below ground often indicates discoloration or necrosis (decay). Little research has been published on the crown rot disease in corn. We will investigate crop production practices that may favor corn crown rot disease, the causal agent(s) and develop an inoculation technique for screening of hybrids and fungicides.

Using On Farm Research to Evaluate Pinto Bean Varieties for Direct Harvest

John Thomas and Laura Thompson

Dry bean variety is critically import for direct harvest! Pod height is significantly correlated (R2= 0.7526) to harvest loss in the direct harvest of dry edible beans thus a good upright bean structure is necessary. Grower harvest loss can vary greatly (1 to 12 bu/ac) and is primarily influenced by pod height in dry beans.

Harvest loss greater than 5 bu/ac is considered unacceptable. Pinto bean variety trials from 2015-18 grown in on farm research plots demonstrate pod heights, harvest loss, yields and marginal net returns of common pinto varieties. Data from these 4 years of trials demonstrate varieties with pod heights (% pods > 2 inches above soil surface) ranging from 66 to 95%, harvest losses from 2.2 to 7.9 bu/ac, yields from 41 to 57 bu/ac and marginal net returns ranging from $487 to $741 /ac. Evaluating the data and choosing the best suited varieties is essential to the profitable production and direct harvest of dry edible beans.

Direct harvest of dry edible beans is on the increase in western Nebraska growing from 5% to 25% in the past 8 years. 70 to 80% of dry edible beans are currently direct harvested in the northern states. Direct harvest of dry edible beans is accomplished by one pass through the field with a combine at harvest time. Traditional harvest of dry beans is accomplished by cutting then wind-rowing followed by drying then combining. Direct harvest requires less field operations and leaves beans less vulnerable before combining. Successful direct harvest requires: upright bean varieties holding pods above 2 inches from soil, a very level field surface, Good weed control and the correct combine header and a skilled operator.

Developing the Next Generation simulation model for efficient Agroecosystem

Yvon Ukwishaka

Over the years, enhanced crop simulation models have been developed for efficient agroecosystems based on changing climate conditions. The advantage of crop models is the ability to visualize, simulate, and present quantitative information on crop growth related to environmental changes on a large scale. This project aims to verify and validate the newly developed Crop, Soil, And Land Simulation "CLASSIM" model, which not only simulates crop growth but also assesses crop impact on soil and vice versa. CLASSIM predicts crop growth, yields, water use, and nutrient uptake during various stages of crop growth using weather, soil, crop, and land management input data. This year, potatoes' destructive and non-destructive ground truth data were generated from Sutherland, NE. The generated data will be used to train the model for more accurate predictions. Potatoes' growth simulation showed variation in outputs after changing irrigation input parameters. Significant differences were observed between auto-irrigation (A-IR) and regulated irrigation (R-IR). CLASSIM simulated high total biomass (A-IR=1440.14 kg/ha, R-IR=26766.03 kg/ha) and high total yield (A-IR= 5505.17 kg/ha, R-IR=16728.72 kg/ha) in regulated irrigation system than the auto-irrigated system. With A-IR, the model added more water to the soil, leading to high total infiltration (A-IR=16727.75 mm, R-IR=197.30 mm) and lower total Nitrogen uptake (A-IR=813.36 kg/ha, R-IR=5739.01 kg/ha) because of N leaching below the root zone. In the future, CLASSIM will be trained for more crops, including soybean and corn. The model is also expected to clearly show how crops and soil impact each other throughout growing seasons.

Soybean Gall Midge: Evaluating Planting Date and Seed Treatment as a Management Strategy

Natasha Umezu

In late June 2018, soybean farmers in four midwestern states began to notice orange larvae associated with wilting and dead soybean plants along field borders. In August, adults were collected resulting in the identification of a new species, the soybean gall midge (SGM). Yield losses of 17-31% have been reported in SGM infested field increasing the need for reliable management practices. As a result, a field study was conducted in Lancaster County, NE to evaluate the impact of planting date in combination with seed treatment as a strategy to mitigate injury from SGM. To evaluate these strategies, a split-plot randomized

complete block design was used with five planting dates as the main plot starting on April 22nd with plantings occurring every 10 days until June 1st. Split-plot treatments consisted of untreated and Gaucho 600 (imidacloprid) treated seed. Plots were evaluated for infested plants, larval number, and plant injury 2-3 weeks after first adult emergence. Results from 2020 showed that plots planted in mid- and late-May had a reduction in number of larvae/plant, both with and without seed treatment. Gaucho reduced larval number with early plantings but did not have any significant yield differences. The results from this study will contribute to a broader IPM strategy for SGM.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