INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES

NORTH PLATTE Natural Resources District

Nebraska Water Center
Daugherty Water for Food Global Institute

2021 Nebraska Water Conference:

"The Shape of Water in Western Nebraska"

AUGUST 16, 2021

University of Nebraska Panhandle
Research & Extension Center
Scottsbluff, Nebraska

Posters

Identification and Introgression of Drought and Heat Adaptation from Tepary Beans to Improve Dry Beans

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Keywords: Multi-environment trials (MET), Genotype by environment interaction, Interspecific lines, Drought adaptation to Western Nebraska, Tepary beans (P. acutifolius A Gray) dry beans (P. vulgaris L.), Best linear unbiased predictors (BLUPs).

ABSTRACT

Drought and high temperatures, two of the leading constraints driven by climate change, limit the grain yield in dry beans (Phaseolus vulgaris L.) globally. Conversely, the tepary bean (Phaseolus acutifolius A. Gray), a desert-adapted species related to the dry bean, has a unique array of drought and heat tolerance traits. Introgression of tepary bean traits into the dry bean could improve the dry bean's ability to tolerate drier and warmer conditions. Understanding the adaptation of tepary beans to drought and heat stress throughout several environments strengthens the strategy of introducing useful tepary variation into the dry beans. Here we report the first muli-environment trials (MET) selection for drought and heat tolerance in tepary beans, crossed with elite dry beans. Also, we report an initial evaluation of drought stress in western Nebraska of the interspecific lines that resulted from the crosses between tepary and dry beans.

Multiple-Point statistical Simulation of Glacial Aquifer Heterogeneity for Improved Groundwater Management

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Keywords: Airborne Electromagnetics, glacial; aquifer heterogeneity, multiple-point statistics

ABSTRACT

Quaternary glacial aquifers are major sources of water for irrigation in eastern Nebraska, USA. Management of groundwater in these aquifers requires an understanding of local aquifer geometry, properties, and interconnectedness. This work aims to model aquifer heterogeneity and to characterize aquifer-to-aquifer connections using dense Airborne Electromagnetics (AEM) data and multiple-point statistics (MPS) in the Shell creek watershed, eastern Nebraska. We developed a transfer function by comparing borehole lithology to AEM resistivity and then translated the AEM resistivity values to a binary sand/clay classification scheme. We used a preferential simulation path to generate 100 realizations and to calculate sand and clay E-type maps. The results show a high degree of heterogeneity that can cause aquifer anisotropy and a complex groundwater flow system. Vertical and horizontal slices from MPS model show variations in aquifer geometry and locally disconnected aquifer systems. Future work will involve incorporating the MPS results into a 3D transient groundwater flow model and simulation of flow under various aquifer management scenarios.

Conceptual Framework for Integration of Gossym with 2DSoil, and Stomatal Conductance based Transpiration and Photosynthesis Model

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Keywords: GOSSYM, Stomatal conductance, 2DSoil

ABSTRACT

Gossym is a mechanistic process-level cotton crop simulation model. To improve Gossym's predictions of below ground soil processes, 2DSoil which is a 2D finite element-based soil process model is integrated into the Gossym. To simulate the transpiration and photosynthesis as a function of stomatal conductance which is controlled by environmental conditions (radiation, temperature, relative humidity, vapor pressure deficit, CO_2 concentration, etc.) and soil water status, the photosynthesis model in Gossym is replaced by Farquhar biochemical model of photosynthesis and Ball-Berry leaf energy balance transpiration model. The developed model can better simulate the below-ground processes (water flow, nutrient transport, root growth, and root nutrient uptake), photosynthesis, and transpiration. The developed model can be used for cotton crop modeling under varying soil water conditions, nutrient stresses, and CO_2 dynamics.

Optimizing Nitrogen Management in Furrow-Irrigated Corn field to Increase Grain Yield and Ensure Groundwater Quality

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Keywords: Crop Sensors, Inhibitors, Nitrate leaching, Polymer Coated Urea

ABSTRACT
In an irrigated farmland, mismanagement of water and fertilizer can cause groundwater contamination. Furrow-irrigation still accounts for a significant number of acres and leaches more nitrate than fields irrigated with drip or sprinkler system. The 3-yr experiment was initiated to evaluate the effects of controlled- or slow-release nitrogen (N) fertilizer on grain yield and nitrate leaching in furrow-irrigated corn at Panhandle Research and Extension Center, Scottsbluff in 2021. The main treatment included combinations of three N sources (Polymer Coated Urea, Urea with urease and nitrification inhibitors, and Urea) and four N rates (50%, 75%, 100%, and 125% of recommended rate). There were two additional N treatments based on crop canopy sensing at V6-V8 and V10-12 crop growth stages. Water samples are being periodically collected using suction-cup lysimeters installed at five feet depth in selected plots. This paper discusses the rationale, objectives, and methodology used in the experiment.

The Effects of Land Use Type on Nutrient Fluxes in the North Platte River, Nebraska, and Spatial Variation in Nutrient Limitation

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Keywords: nutrient fluxes, nutrient limitation, water quality, North Platte River, land-use effects

ABSTRACT

From the Wyoming-Nebraska border to Bridgeport, Nebraska, land use and surface water are hyper-connected through an intricate system of canals and tributaries that drain the adjacent land into the North Platte River (NPR). Previous research has explored how land-use types affect nutrient fluxes in surface waters, and my research expands upon this foundation considering western Nebraska provides a single climate and geographical area to explore the spatial variation in nutrient fluxes from three major land-use types - row crop, concentrated animal feeding operations, and urban. By collecting water samples from the canals, tributaries, and NPR, further analyses will be done to quantify nutrient fluxes (nitrates, phosphates, and ammonium) from the land as well as those entering into and leaving the study area. Additionally, my research also includes a nutrient limitation experiment to explore how periphyton growth in the NPR varies when supplying nutrients in the form of nutrient diffusing substrates.

Participants gather atop Lake McConaughy's Kingsley Dam during the 2018 Nebraska Water & Natural Resource Tour (opposite page)