

The Corn Growers' Association of North Carolina Invites You to Participate in Growing Our Industry

The old saying "If it was easy, everyone would do it" certainly applies to growing corn in North Carolina. From too much rainfall in 2018 to high temperatures and drought in 2019 – not to mention rapid changes in corn prices – it seems that each year brings new challenges.

High temperatures compounded by periods of dry weather were our worst enemy this growing season. Fortunately, since we knew it was to be an El Nino year, and had expected higher temperatures we initiated some studies to look at that. What we found was that available water is the key to keeping the plant cool and avoiding severe yield losses.

By planting fewer plants per acre in narrower row spacing, providing more space between plants, improved soil retention of water through ripping or better aggregation, resulting in more water per plant and some remarkable yield results. We have the genetics to tolerate stress, we just need to give those genes a chance to work. That is why many of you found this season to be a year of feast or famine.

Feast where you had the water to keep the plant cooler. Famine where you ran out of water.

While the final numbers are not in, it appears that despite the heat and drought 2019 will be one of our better crops. This is a tribute to your ingenuity, the advancing genetics of corn, and to better management practices. This fall and winter will be a good time to examine the results from the Official Variety Trials to see which hybrids did the best under the stresses we saw this year and to learn how to manage those hybrids for consistent yield results regardless of the weather.

As you reflect on your corn production practices, remember you have a resource that can help you solve problems or enhance current opportunities. Please take a few moments to let us know what problems you would like to see addressed or, if you think present or past projects have been successful in improving your farming operation, let us know that as well. Working together we can be successful!

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2019 Research Projects

New projects

Effects of Cover Crops and Tillage on Long-term Tillage Plots

NRCS/NCCES Code 19-01

Leaders: Deanna Osmond, Alex Woodley, Josh Heitman

First year of a two-year project

Project funded: \$6,000

Objectives: Assess nitrogen uptake of corn at historical nitrogen fertilizer rates and with no nitrogen fertilizer to determine whether long-term conservation tillage provides additional nitrogen to corn allowing producers to reduce their rates. Also, to compare crop yields from different tillage systems with and without a cover crop and another tillage type without cover crop and with and without nitrogen.

Project description and relevance: Soil health is being discussed throughout the country but a clear definition remains elusive. There are many claims being made that no-till and/or cover crops will allow farmers to reduce their nitrogen rates but there is little evidence that demonstrates the need to change fertility recommendations. The objective of this research is to determine the nitrogen supplying capacity of the soil from different tillage and cover crop systems.

Identification of Genes for Resistance to Nutritional Deficiency in Maize

NRCS/NCCES Code 19-02

First of a one-year project from 2/1/19-1/31/20

Leaders: Eric Davis, Peter Balint-Kurti

Project funded: \$4,000

Objectives: Symptoms of calcium deficiency can be manifested in plants as wilting, necrosis, or bottom of developing fruit. Calcium deficiency can be caused by low calcium levels, but is more often related to low transpiration. Factors that limit transpiration can indirectly cause calcium deficiency symptoms. These factors can include drought, as well as dark or humid conditions and high salt levels in the soil, reducing transpiration caused by osmotic pressure.

Situations in North Carolina in which this could occur include cases of poor fertilizer management, excess applications of animal wastes or biosolids, and saltwater intrusion

in coastal areas. In corn the symptoms of calcium deficiency are often call 'bull whip', or 'buggy whip'.

Project description and relevance; Conduct at least one or more replication of a greenhouse mapping experiment with an IBM population. If the replications correlate with each other, the data will be combined to identify 'bull whip' resistance.

Experiments will also be performed to try to precisely identify the causes of the bullwhip symptoms.

Evaluation of Novel Approaches for Early Detection of and Detailed Characterization of Maize Foliar Disease

NRCS/NCCES Code 19-03

Leaders: Peter Ojiambo, Peter Balint-Kurti, Michael Kudenov

Project funded: \$6,000

Objectives: using the traditional assessment of quantitative levels of field resistance to maize foliar pathogens using a visual scale, it would be helpful to be able to measure parameter such as rate of disease progress and timing of first appearance. It would also be helpful to be able to extract qualitative as well as quantitative data from field trials. The proposal is to undertake a study to assess the utility of novel phenotyping approaches for the detailed characterization of foliar disease resistance in the field.

Project description and relevance: A so-called 'near-isogenic line', or NIL population will be used. This is a line that is largely derived from a single recurrent parent so that all lines are genetically similar to each other (usually greater than 90%) and to the recurrent parent but differ at small regions of the genome. In this project a portion of the B73 NIL population will be reassessed for Southern Leaf Blight (SLB). A set of 50, more or less, NIL's will be grown that have previously been shown to be SLB resistant in at least three randomized replications with repeated B73 and resistant checks.

Renewal Projects

Novel Agricultural Water Management Systems for Increasing the Production and Consistency of Corn Yields in North Carolina

NRCS/NCCES Code 18-01

Third year of a three-year project continuing from on 2/1/19-1/31/20

Leaders: Mohamed Youssef, Chad Poole, and Lamyaa Negm

Objectives: The primary goal of this research and education project is to evaluate and demonstrate an economical system to automatically manage agricultural drainage and sub-irrigation in order to maximize corn yields, conserve water, and significantly minimize direct user management.

Project funded for \$28,930

Corn Problem Diagnosis Support for Cooperative Extension Agents

NRCS/NCCES Code 11-09

Support amount: \$1,000

Third year of a three-year project continuing from 2/1/19 to 1/31/20

Leaders: Carl Crozier, by Lindsey Thiesen, Ron Heiniger and Kristin Hicks.

Objectives: Support efforts by cooperative extension agents to diagnose specific crop nutritional or disease problems in corn.

This project will fund a limited number of samples to be submitted by cooperative extension agents for analysis at the NCDA&CS Agronomic Division plant tissue lab, and the NCSU Plant Disease & Insect Clinic.

Project description and relevance: While most farmers utilize soil testing, few utilize tissue sample testing to diagnose disease, insect and fertility problems. Problem diagnosis is an important tool that Extension agents use in advising producers to select appropriate corrective management approaches.

The approach of the research is to strengthen crop problem diagnosis efforts through funding from several commodity organizations to fund analysis of samples submitted by Extension agents.

This project will fund analysis of 110 plant tissue samples and 20 plant insect and disease clinic samples collected from problem corn fields.

This program should result in more qualified agricultural agents and in farmers that better understand their production constraints.

Support for a Small Plot Combine for Corn

NRCS/NCCES Code 16-02

Leader: Ron Heiniger

Fourth year of a six-year project from 2/1/19 to 1/31/20

Support amount: \$30,000

Objectives: This proposal seeks continuing funding support for the purchase of a small plot combine for use in harvesting corn research trials across the state.

Developing GLS-Resistant Female Lines

NRCS/NCCES Code 17-04

Leaders; MD Krakowsky, MM Gooman, D Dowden

Third year of a three-year project from 2/1/19-1/31/20

Support amount: \$12,300

Objectives: Develop useful Stiff Stalk (female) parental lines having good gray-leaf spot resistance, good seed quality and mid-season maturity, suitable for use North Carolina hybrids for western North Carolina (and in the east should female resistance become essential in that area).

Project description and relevance: Gray-leaf spot has been identified in the eastern part of North Carolina, but is a major issue in the western part of the state. Development of new female lines with good gray-leaf spot (GLS) resistance is needed as this disease has become more aggressive in North Carolina. GLS is now the secondmost important corn disease in the US.

Relatively few commercial hybrids have good GLS resistance, and most have only one resistant parent, the male. There is very little resistance among female lines.

Are Nutrient Deficiencies Limiting High Corn Yield? Tissue and soil Analyses of NC Corn Yield Contest Entries

NRCS/NCCES Code 17-10

Support amount: \$8,362

Project leaders: Jeffrey White, Ron Heiniger, Gail Wilkerson

Objectives: Determine whether tissue macro and micronutrient deficiencies are apparent at the high yields achieved by Corn Yield Contest entries and explore the extent to which any deficiencies may limit yield.

Project description and relevance: the goal is to leverage the NC Corn Yield Contest by studying corn tissue nutrients and corresponding soil test in high Contest yields.

Unique Inbred Line Development for Central and Eastern North Carolina

NRCS/NCCES Code 18-03

Third year of a three-year project beginning 2/1/19-1/31/20

Leader: MM Goodman

Support amount: \$17,695

Objectives: Develop high-yielding lines with good multiple disease resistance that thrive under the changing weather patterns facing central and eastern North Carolina. Utilize the unique disease resistance found in high-yielding tropical sources, and combine high yield, excellent disease resistance, and good standability into line that attract both public and private company use.

Project description and relevance: To fill important gaps that are currently not being addressed by other programs, public or private. The domestic breeding base is shrinking and there are few new places to find new breeding materials, the elite tropical materials are not being used. It is surmised that the use of tropical breeding materials should counteract the increasingly hotter and more variable summers in North Carolina.

Developing Techniques for Measuring Emergence and Early Growth on Corn Hybrids in North Carolina

NRCS/NCCES Code18-04

Second year of a three-year project beginning 2/1/19-1/31/20

Project funded for \$36,197

Leaders. Dr. Ron Heiniger, Ryan Heiniger

Objectives: Develop new tools for phenotyping multiple hybrids for emergence and rate of early growth and to use those tools in conjunction with the North Carolina Official Variety Testing Program (OVT) to rate hybrids for emergence and early growth in the southeastern United States.

Project description and relevance: Research studies over the past five years have conclusively shown that high corn yields are only possible when the corn emerges uniformly and grows rapidly from emergence to V6. While growers have been quick to adopt new management practices such as careful selection of seeding depth, use of micronutrients, or the use of 2x2x2 fertilizer placement, the important practice of selecting corn hybrids based on emergence and growth characteristics has not been

adopted because there is no independent information on how hybrids differ in these characteristics.

This project has the potential to impact one of the most important decisions a grower makes; the selection of a corn hybrid, and to enable the grower to find hybrids better suited to their individual management systems.

Rapid Cycling Selection for Resistance to Fusarium Ear Rot and Fumonisin Accumulation in Corn

NRCS/NCCES Code18-05

Second year of a three-year project to begin 2/1/19-1/31/20

Project Leaders: Charles W. Stuber, and James B. Holland

Project funded for \$6,000

Objectives: Optimize protocol for rapid high throughput for genotyping for corn and use high throughput genotyping to select corn populations for resistance to Fusarium ear rot and fumonisin contamination, two generations per year

Project description and relevance; Fusarium Ear Rot and fumonisin contamination caused by the infection of the fungus *Fusarium verticillioides* threatens North Carolina corn production.

The most desirable control strategy for Fusarium ear rot and fumonisin contamination is the use of resistant corn genotypes. Results from projects previously funded by the Corn Growers Association of North Carolina show that genotypes differ in their resistance, but none has sufficient resistance to control the disease, and that heritability of resistance is high enough for breeding to be effective. The goal of this project is to continue to research genotypes for fusarium ear rot resistance.

Measuring Rate and Efficacy of Fungicides Using Traditional vs. Under Canopy Placement

NRCS/NCCES Code 18-11

Second year of a three-year project to being 2/1/19-1/31/20

Project funded for \$3,000

Leaders: Scott Tilley, Lindsey Thiessen, and Rod Gurganus

Objectives: Compare traditional over-the-top spray application to the new 360 Undercover application hardware designed to spray into the canopy at a more equal and consist rate, as well as determine if better placement and timing of fungicide material can lead to lower rates but equal efficacy. Determine if a better placement and timing of fungicide can lead to greater yield potential.

Project description and relevance: Determine the rate and efficacy of the application of fungicides, which continues to be a problem with North Carolina growers, and how such application can save or add to a final yield, especially when corn prices are low.

Validation, Characterization, and Precise Mapping of Genes associated with Resistance to Multiple Diseases in Corn

Project Leaders: Peter Balint-Kurti, and Eric Davis

Objectives: Validation, characterization and precise mapping of genes associated with resistance to multiple disease in corn.

Project funded for \$6,000

Corn Growers Association of North Carolina funded three off-cycle funding requests in March 2019 and they are as follows:

Extending the Capacity of Corn OVT for North Carolina Growers

Project Leaders: Ron. W. Heiniger, Ryan W. Heiniger

Project was funded for \$30,000 for one year

Objectives: Increase the capacity of the North Carolina Official Variety Testing (NCOVT) program to execute quality research in corn and corn silage trials through the purchase of a precision planter. This updated equipment will be used to plant corn and corn silage OVT tests and to support corn testing performed by NCSU Research or Extension (agent) groups.

Project description and relevance: Currently the Official Variety Testing program owns a 24-year-old 2-row Almaco Vacuum planer which is used to plant corn and corn silage. While many farms may have equipment this old or older, it is important for the State Variety Testing program to showcase the best for North Carolina Growers and it simply cannot be done with current equipment. Maintenance alone to keep the 24-year old planter in running condition requires a significant budget.

In addition, the Almaco planter lacks key features needed for agricultural precision planting including 1) the capacity to plant by GPS signal for precise plots and alleys, 2) the option to apply fertilizer at planting which the majority of NC growers do, 3) the capacity to dynamically adjust row spacing to fit location and test requirements; and 4) the ability to plant into no-till locations.

Over the last two years, partnerships with faculty in Crop and Soil Sciences have allowed the program to upgrade equipment for small grains, upgrade and replace trucks as well as spray equipment. A precision planter is the final pieces of equipment needed to bring the NC Official Variety Testing Program completely into the 21st century and ready for the next 25 years.

Using UAV Imagery to Detect Crop Damage after Severe Weather Events

Project Leader: Jason Ward

Project was funded for \$24,867 for one year

Objectives: After a severe weather event crops must be rapidly assessed for producer decision making, disaster declarations, and insurance claims. Producers need to know how to assess losses and plan remediation. This project will identify underlying relations to describe crop damage from UAV imagery, automate the analysis process, and engage stakeholders to better understand data.

This project will build on a preliminary project to use unmanned aerial vehicles (UAV's) to build tools to detect crop damage from imagery and to then automate the process using machine learning tools. New data-driven tools are needed to skillfully identify the presence and severity of crop damage. Long-term outcomes of this project will allow better response, recovery, and resiliency when crop damage occurs.

North Carolina Basis Fundamentals

Project Leaders: Nicholas Piggott, Heidi Schweizer

Project was funded for \$24,900 for one year

Overview: North Carolina is deficit in feed ingredients with current estimates requiring 310 million bushels annually to feed the 'tails and feathers' but the five-year average of corn, wheat and sorghum production is estimated to be 155 million bushels leaving a deficit of 155 million bushels (or 50%). Corn is the predominant feedstuff making up around 112 million bushels annually (or 77%) on an acreage base of 886,000 acres based on the latest five-year average. The 155-million-bushel deficit must be met with feedstuffs imported into North Carolina from other US states or from overseas.

Corn acreage in recent years has declined from the 1,000,000 acres in 2016 to 890,000 acres in 2017 and 910,000 acres in 2018. The trend towards international imports could change the nature of feed markets, for corn especially, but international imports could change the nature of feed markets for corn especially, but internal imports also face high transportation costs and are subject to procurement holdups, therefore, it may still be most cost effective to incentivize local production.

The proposed project will establish current baseline levels of corn basis at different markets and measure flows of feed materials into North Carolina and their relationship to corn basis. Funding will be used to hire a graduate student and purchase propriety shipping data that will be combined with public and private data available from other sources.

Research Objectives:

- 1) To establish a database of historical corn prices at different North Carolina markets
- 2) To establish a database of inflows and outflows of feedstuffs using data from the Census Bureau, US Department of Transportation, Lloyd's List and Blomberg.

Expected End Products: Findings will be presented in outreach forums including written work online and in person at grower meetings. Presentations will discuss the potential impact of supplemental feedstuffs sourcing on North Carolina corn basis. Conveniently packaged historical basis tables for different market locations will be made available online for all growers and researcher to download for personal use.