North Carolina Corn Report – 2021 Season

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2021 was a great year for growing corn!

North Carolina corn growers experienced as close to a perfect corn growing season as we have ever seen. During harvest not a single tropical storm or hurricane made landfall in North Carolina. Even better corn prices have been strong and the outlook for corn prices for 2022 looks good.

However, there are storm clouds on the horizon. Supply chain problems, rising inflation, and transportation costs have resulted in dramatic increases in fertilizer, fuel and chemical prices. Many growers are wondering if they can even afford to grow corn in 2022. Clearly, it will take careful planning and expert knowledge to make the right choices in terms of which crops to plant, how much fertilizer to apply, and what management changes to implement.

Because they are corn growers just like you the Corn Growers Association of North Carolina understands what you are facing. Already, we are planning for early information sessions to help you understand the impacts of rising input costs on your choices for this coming year.

Dr. Nick Piggott from NC State has put together a crop budgeting tool that allows growers to examine rising input costs on their bottom line. Using information collected under a grant from the Corn Growers Association Dr. Stephanie Kulesa has guidance on using manure to supplement commercial fertilizer applications. A new Corn Climate Dashboard is being released in just a few weeks that will help you navigate weather and management decisions in 2022. These are examples of how your support of research is coming full circle to help you in managing these changing situations in these difficult economic times.

As you look at the research projects that were funded for 2021 you will find studies looking at better genetics, improved weed control practices, online tools that will help you find better price opportunities for corn, and other projects that are designed to improve management and your return on investment. As you read about each of these, we encourage you to consider what other information would be valuable to your farming operation.

Let us know what <u>your</u> NCGGA can do to improve your corn business.

Notice of Annual Meeting

Corn Growers Association of North Carolina will conduct the required annual meeting of all assessment paying corn growers selling corn in North Carolina on Friday, January 14th at 10:00 am at the Sheraton Imperial Hotel in Durham, North Carolina.

This meeting is open to all corn growers in the State of North Carolina.

NC Farmer Resource & Crisis Line

NCARS/NCCES Code: 21-00

Funding Request: $12,000

Project Leader: Robin Tutor Marcom, EdD, MPH, NC Agromedicine Institute

Objectives:

The objective of this project is to establish and maintain a North Carolina farm resource and crisis line.

Project Description and Relevance:

NC Agromedicine Institute will obtain software and training necessary to establish a farm crisis and resource line with case management capability. Working in partnership with NC Cooperative Extension, NC Department of Agriculture & Consumer Services, USDA programs, NC Farm Credit, and behavioral health and primary care providers, the Institute will equip the line's database with resources necessary to create a 'one-stop shop' for farmers in need of assistance. Farmers will benefit by being able to call for assistance knowing their information will be kept confidential and shared with only those who can help.

Software will permit real-time documentation of encounters and sharing of resources/referral information. When issues needing immediate attention are identified, they will be automatically escalated so that follow-up cannot be over looked.

The stigma associated with being unable to continue farming or being depressed, anxious or having suicidal ideation often prevents farmers from seeking help. If they do seek help, behavioral health services in rural areas are limited, especially for providers who understand the 'culture of agriculture'. The availability of a well-equipped centralized hub will expedite farmers' connection to resources and crisis intervention.

Relationship to Similar Projects in NC and Other States:

The Institute, in collaboration with NC Cooperative Extension, applied to USDSA for funds to establish a farm and ranch stress assistance network for two consecutive years. Neither proposal was successful with lack of an established farm crisis and resource and resource line being cited by reviewers as a reason for not funding. This funding request will better position the Institute for future grant requests to aid farmers and their families.

Evaluation of Corn Hybrids for Climate Resiliency and Nutrient Use

NCARS/NCCES Code: 21-01
Funds requested: $24,200

Project Leaders: Chad Poole, Ron Heiniger, Luke Gatiboni

Objectives:

The primary goals of this research and extension project are to evaluate the latest corn hybrids to various degrees of soil water stress. Specified objectives are:

1. Timely evaluation of the yield response of new hybrids to multiple degrees of soil water stresses.
2. Evaluate the nutrient uptake demands of each hybrid under different degrees of soil water stress

3. Develop and provide nutrient management recommendations for hybrids given different degrees of stress during the growing season.
4. Provide Extension data for placement of specific hybrids given a growers' water management capabilities.

Project Description and Relevance:

This research and Extension project will evaluate the potential yield of various corn hybrids from multiple maturity groups to various soil water conditions in a timely manner. Excessive soil water, deficit soil water and adequate condition will be considered. In addition, the project will evaluate the nitrogen and phosphorus use of the hybrids under each soil water scenario.

This information will provide valuable data for hybrid selection and nutrient needs given observed and expected soil water conditions for individual farms.

Development and Assessment of UAV-based Crop Lodging Detection

NCARS/NCCES Code: 21-03
Funds requested: $10,229

Project Leader: Jason Ward

Objectives:

To continue to develop UAV-based tools to detect and describe corn lodging

Project Description and Relevance:

Severe weather, especially during Atlantic hurricane season, will continue to impact corn production in North Carolina. After the negative impacts have occurred, quickly assessing the extent and severity of the damage can aid in recovery and mitigation of losses. UAV's or manned aircraft provide opportunities to survey locations where crop lodging may have occurred but often significant additional analysis was needed.

Rapid assessment of the collected imagery can help to direct effort to where it is most needed.

During Fall 2020, simulated crop damage imagery was shared with colleagues in the Department of Computer Science so that they can leverage further analytical techniques to refine the ability to detect lodging in images. Their approach involved image segmentation which should be a more robust method to develop new models to detect lodging from imagery.

The ideal end goal is the ability to collect UAV imagery of a field and to automatically estimate the number of acres negatively impacted along with an estimate of the severity of the damage.

Beyond recovery and response, creating the ability to uniformly quantify crop lodging can inform crop improvement. Documenting varietal differences in lodging can help producers choose seed with greater lodging resistance. This research could also be applied to detecting wildlife damage or insect damage that physically alters crops.

As to meeting this objective, existing imagery of simulated and actual crop lodging, from 2018, 2019, and 2020, will be annotated so that the images can be used to train and evaluate automated crop damage detection models.

Development of Corn Lines Adapted to Early Planting and Low Phosphorous Availability Conditions in North Carolina

NCARS/NCCES Code: 21-04
Funds requested: $5,000

Project Leader: Ruben Rellan-Alvarez

Objectives:

Develop maize varieties with high phophorous efficiency adapted to early planting conditions in North Carolina.

Project Description and Relevance:

Phosphorus is an essential element to life as it underpins many biological processes and the productivity and sustainability of global food systems. However, most phosphorous is sourced from non-renewable phosphate mines, is inefficiently utilized by crops, strongly binds to soils, and runs off into surface waters. Unlike nitrate, phosphate cannot be chemically synthesized or biologically fixed from atmosphere. We rely on phosphate rock sources that are predicted to be exhausted within the next 100 years if the current use is not reduced.

Phosphate fertilizer used in agriculture is the largest source of phosphate input into human made systems. On the other hand, phosphorus deficiency can affect yields in early planted corn.

In this proposal the researchers plan to identify maize varieties adapted to North Carolina early planting conditions with low phosphorus availability. The researchers will focus on the early developmental stages of growth because it is at these stages when phosphorus deficiency can have a higher impact on plant development and yield particularly during cold, wet, acidic pH conditions.

They will identify maize varieties with high phosphorus efficiency at early developmental stages.

The researchers will use several sources of maize varieties including selected GEM project entries as well as selected mapping population developed with CML530, (developed by CIMMYT for their low pH, low phosphorus program) as the recurrent parent and landraces adapted to low phosphorus soils.

In total, the researchers plan to evaluate around 200 entries.

The researchers will plant these lines early in the season in Clayton fields with reduced phosphorus availability and early vigor will be measured and phosphorus content at early developmental stages in V4-V6 leaves.

The plants will be self-harvest within a row and then select the top 25% performers using a combination of the phosphorus efficiency content, early vigor, and yield.

Paraquat-Resistant Italian Ryegrass: What does it mean for corn producers?

NCARS/NCCES Code: 21-05
Funds requested: $23,150

Project Leaders: Charlie Cahoon, Wes Everman

Objectives:

1. Confirmation of paraquat-resistant Italian ryegrass
2. Tolerance of various corn hybrids to commonly used POST herbicides
3. Comparison of non0encapsualted and encapsulated acetochlor for residual weed control in corn.

1. Confirmation of paraquat-resistant Italian ryegrass

Herbicide-resistant Italian ryegrass has long infested North Carolina. In particular, the southern Piedmont has widespread ALS-resistance (Osprey and PowerFlex) and spotty ACCase (Hoelon and Axial XL) and glyphosate resistance. For farmers battling Italian ryegrass biotypes resistant to glyphosate, ALS, and ACCase herbicides, paraquate is the last line of defense for emerged Italian ryegrass. While pyroxasulfone (Zidua/Anthem Flex) provides residual control of the weed, it and other related herbicides, do not control emerged ryegrass.

2. Tolerance of Various Corn Hybrids to Commonly used POST herbicides

Preserving corn yield is paramount to economic profitability. Most grower complaints involved a HPPD-containing product including Capreno, Resicor, Halex GT, and ShieldEX.

3.Comparison of non-encapsulated and encapsulated acetochlor for residual weed control in corn.

Harness herbicide has favorable chemical characteristics for activity in high organic soils including moderate water solubility and low K_{oc} which is why the herbicide has the long-standing standard for residual weed control for Blackland corn production. EC acetochlor has been replaced in the marketplace with by a micro-encapsulated version of acetochlor sold under the tradename Warrant.

Due to encapsulation of the active ingredient, Warrant has improved safety to pre-emergence of cotton and soybean.

Corn Problem Diagnosis Support for Extension Agents

NCARS/NCCES Code: 21-06
Funds requested: $1,000

Project Leaders: Luke Gatiboni, Ron Heiniger, Kristin Hicks

Objectives:

1. This project will support efforts by Extension agents to diagnose specific crop nutritional or disease problems in corn.
2. This project will fund a limited number of samples to be submitted by Extension agents for analysis at the NCDA&CS Agronomic Division plant tissue lab, and the NCSU Plant Disease and Insect Clinic

Project Description and Relevance:

Problem diagnosis is an important tool that Extension agents use in advising producers to select appropriate corrective management approaches. In the absence of such tools, producers are left to attempt diagnosis based only on visual symptoms that can often be misleading, and to correct problems by selecting among numerous potential practices, products, and advertising claims.

The researchers' approach to strengthening crop problem diagnosis efforts is to request funding from each of several commodity groups to fund analysis of samples submitted by cooperative Extension agents.

This is not intended to cover all analytical needs, but for program support to allow agents to diagnose specific problems important to their region of the state.

Funds will be managed through a spreadsheet tallying cumulative samples and remaining funds for each commodity involved. Fund availability will be advertised to NCSU and NCA&TSU Extension agents, as well as notification of fund usage and specific problem diagnosis with each crop.

Impact:

This program should result in more qualified agricultural agents and in farmers that better understand their production constraints. Once the value of these diagnostic efforts is better understood, the researchers expect producers will be more willing to pay the standard diagnostic fees themselves.

Maintenance of Long-term Soil Test Calibration Trials of North Carolina

NCARS/NCCES Code: 21-07
Funds requested: $4,412

Project Leaders: Luke Gatiboni, Deanna Osmond

Objectives:

The objective of this proposal is to maintain three long-term trials used to remine the soil test calibration and recommendation of fertilizer for corn and soybean in North Carolina.

Project Description and Relevance:

Soil test calibration is a continuous process required to maintain up to date recommendations of fertilizers for different crops. The average crop yields are increasing on a yearly basis due to use of best management practices and the development of new varieties. NC State University maintains three long-term trials to annually check if the recommendations of phosphorus and potassium fertilizers based on soil analysis are still adequate. At the three long-term trials locations; Tidewater Research Station (TRS), Peanut Belt Research Station (PBRS) and Piedmont Research Station (PRS), rates of phosphorus and potassium fertilizers are tested.

Rational/Justification:

The soil test calibration is based on research trials in which it is applied to the soil rates of fertilizers and the soil and plant analysis are performed to correlate the analysis results with crop yields. These trials provide the background information to define the best rate of fertilizers for different crops.

Expected End Products:

The researchers will use the results of these trials to change, if need, the rate of fertilizers recommended for North Carolina crops. The results will be presented during winter meetings as well as during the training of Extension agents and crop consultants.

Rip Depth and Fertilizer Placement for Corn

NCARS/NCCES Code: 21-08

Funds requested: $10,948

Project Leaders: Luke Gatiboni, Rod Gurganus, Ron Heiniger

Objectives:

a) Study the optimal ratio of nitrogen applied at planting vs layby on corn yield
b) Study the efficiency of nitrogen applied at planting broadcast vs banded directly under the row at a six-inch depth on corn yield;
c) Study the effect of various ripping depths and placement depths of fertilizers (banded or broadcast) on corn yield

Project Description and Relevance:

The researchers propose to test fertilizer placement and the strip-tillage impacts on corn production in two locations within the Coastal Plain (in Beaufort County) on coarse-textured soils and in Washington County on organic soils).

The first trial will study the effect of applying nitrogen at planting as a surface-applied broadcast treatment versus a subsurface direct-under-row treatment on corn yield. In this study the researchers will also evaluate the effect of various ratios of nitrogen fertilization applied at planting and layby for optimal nitrogen use efficiency.

The second trial will test different depths of ripping, with and without deep fertilizer application.

Rational/Justification:

Timing and placement of fertilizer application are important factors for increasing fertilizer use efficiency, especially nitrogen fertilizers. Sub-surface placement can significantly reduce nitrogen losses through ammonia volitation, and can also minimize losses of nutrients by surface erosion during excessive rainfall events.

The sub-surface application of phosphate fertilizers can also be beneficial as a starter P to promote a fast initial growth of seedlings, especially in cold, wet soils. The application of fertilizer in a band directly under the planted seed could promote deeper root growth, which will increase the efficiency of plants taking up nutrients and water. If nitrogen losses can be reduced by deep placement, it may be possible to apply a higher rate of nitrogen at planting, reducing or eliminating the amount of nitrogen applied at layby.

In no-till situations, strip-till situations, strip-till promotes an improved seedbed, improving planter performance and seed germination. This operation also can potentially reduce pre-plant field passes, reducing costs and avoiding soil compaction. Deep tillage with a strip-till plow can address problems with soil compaction, while placing fertilizers directly into the future root zone of the planted crop. Fixing compacted hardpans promote drainage after heavy rainfall. Strip-till with deep tillage is especially effective in sandy-texture soils where roots need to grow deep to access subsoil moisture.

Incorporating Emergence Rating into the North Carolina Official Variety Trial Corn Hybrid Selection Tool

NCARS/NCCES Code: 21-09
Funds requested: $30,313

Project leaders: Ron Heiniger, Ryan Heiniger

Objectives:

The goal of this research is to utilize the imaging tools that have been developed to rate all corn hybrids entered into the NC Official Variety Test for emergence and early growth and to publish those rating through the NC Corn Hybrid Selection Tool so that corn growers can select hybrids based on emergence. Particular objective are to: 1) improve the process of using UAV imaging to measure corn emergence, 2) to validate the measurements of emergence taken using UAV imaging with measurements from manual counts on the ground and 3) to determine emergence rating for all corn hybrids entered into the North Carolina Official Variety Testing program at all locations and report those characteristics to corn growers for their consideration in selection of hybrids.

Project Description and Relevance:

Numerous research studies from across the United States have now shown that uniform emergence and rapid early growth are essential characteristics associated with high corn yield. While several of these factors can be managed, the soil environmental conditions at planting are among the most important, while being the most difficult to control.

Recent advances in the understanding of corn emergence have resulted in improved methods for measuring uniform emergence including the use of images from unmanned aerial vehicles (drones). This project seeks to take advantage of this new measurement technique to measure and rate emergence on all corn hybrids being tested for yield in the NC Official Variety Testing program and to make that information available to corn growers through the new Corn Hybrid Selection Tool.

Increasing Corn Yield by Managing Root Growth

NCARS/NCCES Code: 21-10
Funds requested: $24,850

Project Leader: Ron Heiniger

Objectives:

The goals of this research are to examine root development in corn under different soil environments and management practices and identify key management factors that increase root growth, nutrient and water uptake, and corn yield. Specific objectives are: 1) to measure corn rooting depth and water extraction over the growing season indifferent soils in North Carolina using different management practices such as seeding rate, row spacing, fertility practices, and hybrids, and 2) to use these measurements to identify key management factors that lead to increased root growth and better nutrient and water uptake.

Project Description and Relevance:

Corn growers in North Carolina are faced with many challenges that make it difficult to achieve high yield. These include frequent heavy rainfall events that result in saturated soils; hot, dry conditions that can occur anytime during the growing season; poorly drained soils; sandy soils that have limited water holding capacity; and heavy clay soils with limited water infiltration. The best way manage corn under these difficult and often changing soil and environmental conditions is to increase root mass and volume.

This project seeks to take advantage of this new technology to measure root growth in different soils using a range of management practices to increase our understanding of corn root growth in North

Carolina and to identify key management factors that can increase root mass and volume with the potential for increasing corn yield.

Project protocol:

Measuring Water and Nutrient Extraction and Root Growth

a. Three main soil series will be selected repressing the main soil regions of North Carolina. These will include organic soils in the Blacklands region, a Norfolk sandy loam in the Coastal Plain, and a clay loam in the Piedmont region of the state.
b. On each soil series a set of management practices will be examined. These will include:
    i. Two row spacing – 20 and 30" rows
    ii. Three plant populations – 28,000, 34,000, and 40,000 seeds/acre iii. Two corn hybrids
    iv. Two fertility systems – starter with early N vs no starter or early N applications.
c. Measurements: in each plot an AquaSpy soil probe will be inserted into the row between corn plants.
d. In addition to the soil probes, canopy temperature will be measured to determine the impact of the soil environment on corn temperature and grain yield will be measured at harvest.

Using the data collected from these research plots the goal is to use the key management factors identified to develop a corn cropping system for each soil series that maximizes root volume and depth.

Developing a Weather and Climate Dashboard for NC Corn Growers

NCARS/NCCES Code: 21-11
Funds requested: $25,000

Project leaders: Ron Heiniger, Rebecca Ward

Objectives:

The State Climate Office of North Carolina will develop an online dashboard to view contextualized forecast and historical climatological information, tailored to a user's location. In addition to the development of the dashboard, the researchers will conduct analysis to provide guidance to growers on longer-term trends and relationships between atmospheric variables (precipitation and temperature) and corn growth in a changing climate. The State Climate Office of North Carolina is well-positioned for this project, with experience producing similar online weather-and climatebased dashboards, expertise in conducting climate research, and equipped with data servers

containing historical climatological observations from thousands of surface weather stations and gridded datasets covering historical periods.

Project Description and Relevance:

This project will consist of three key phases designed to systematically meet the 2021 priorities for Weather and Climate outlined by the Corn Growers Association. In this project the researchers will 1) identify end-users' needs for short-to long-term weather and climate information; 2) develop a dashboard and research analyses that enable users to visualize and explore weather and climate information to support management decisions for the current season as well as longer-term strategic planning; and 3) evaluate the resulting online dashboard and research products in terms of their usability and usefulness.

Support of the New NC OVT Corn Hybrid Selection Tool

NCARS/NCCES Code: 21-12
Funds requested: $1,400

Project Leaders: Ryan Heiniger, Ron Heiniger

Objectives:

The goal of this proposal is the annual support of the newly establish NC OVT Corn Hybrid Selection Tool. This tool can be found at ncovt.medius.re

Project Description and Relevance:

Hybrid selection is one of the most important decision a grower can make, accounting for up to 60% of their overall yield level at the end of the season. The role of the North Carolina Official Variety Testing Program (NC OVT) is to provide growers with an unbiased source of hybrid performance data across North Carolina. Prior to 2020, this data was delivered to growers using hard copy printed yield tables (Green Book) or electronic yield tables loaded to the NC OVT website. While these data delivery methods were effective, they were limited by the depth of data presented. A grower could identify the highest yielding hybrid at a location or across the state, but that same grower was unable to access characteristic information or performance information by other criteria such as maturity or disease resistance using those static data tables.

To solve this issue, the NC OVT partnered with Medius.re to develop a database for corn hybrids results from the NC OVT trials (Corn Hybrid Selection Tool). This database spans multiple years and provides the growers with multiple options to search and filter their data to meet the specific demands of their operation. A search that would make multiple hours using the old tables, now takes minutes using the Medius database. Additionally, growers can access images and other supporting documentation for each hybrid that was previously unavailable.

The goal of this proposal is the continued support of this new Corn Hybrid Selection Tool. The money from this proposal would be used to pay for the annual license fee for the tool, including future features within the tool and support using the tool. Funding the annual license for the Corn Hybrid Selection Tool would give the Corn Growers of North Carolina an opportunity to guide the development of this tool moving forward.

Impact of In-Season Manure Injection on Ammonia Losses and Corn Yield

NCARS/NCCES Code: 21-13
Funds requested: $10,471

Project Leaders: Stephanie Kulesza, Alex Woodley

Objectives:

1) Assess the effectiveness of in-season swine manure injection on corn yield and quality.
2) Determine ammonia loss reduction when manure is injected in-season versus surface applied
3) Maximize Extension impact through growers' meetings, Agent-led research, field days, and fact sheets

Project Description and Relevance:

New injection bars available through Zoske, Bazooka-Farmstar, and Dietrich allow for manure injection into standing corn. Initial results out of Ohio and Minnesota indicate corn can withstand injection below the V5 growth stage without injury. The potential to utilize in-season injection could drastically increase the application window of swine sludge in a corn rotation, allowing the grower/applicator to get in the field when field conditions are optimum, especially in rainy springs such as we saw in 2020. However, there is little information on this injection system in the sandy soils of the Coastal Plain. Therefore, the researchers propose small scale field testing to identify the impact of swine sludge injection on corn yield and quality.

Swine producers continuously struggle with land application site management due to field conditions and complains associated with odor and other nuisances, such as flies. Manure injection significantly reduces the odors associated with application and increases nitrogen capture, increasing value of the material being applied and increasing the economics of transporting manure off the farm.

The goal of this project is to identify whether in-season injection is feasible in North Carolina.

Understanding Corn Response to Sulfur Fertilization

NCARS/NCCES Code: 21-14
Funds requested: $3,128

Project Leaders: Alex Woodley, Luke Gatiboni

Objectives:

The overreaching goal of this study will be to document the benefits and impacts of sulfur (S) fertilization on corn yields following the presence of either fallow ground or a cover crop (cereal rye, crimson clover, and crimson clover/cereal rye mix). This study will be embedded within a nitrogen rate by cover crop multi-state (15) federally funded projects. The researchers propose the following main objectives:

1. Determine corn yield response of sulfur fertilization in corn that has received a high rate of nitrogen (N) application and compare it to a plot with only the high rate of N application. The paired comparisons will be in corn planed into bare ground and corn planted in ground that had cereal rye, crimson clover and crimson clover/cereal rye mix.
2. Measure soil S levels prior to cover crop termination, at S fertilization and monthly until harvest at surface and subsurface depths to track S movement and potential immobilization occurring in the cover crop plots.

3. Measure corn plant tissue S monthly to measure S uptake and determine the ideal timing for tissue sampling that corresponds best with yield outcomes and best relates to soil S status.
4. Use this research as a first step to collect data towards assessing the need for a modernized sulfur critical level and S recommendations for corn in North Carolina.

Project Description and Relevance:

An adequate supply of sulfur is critical for plants to grow healthy and complete their life cycle. Historically, S has not been widely applied in crop production because crops were able to obtain enough from the soil and atmospheric deposition. However, the combination of higher yielding crops, cleaner air, and purer fertilizer products has led to increased frequency of S deficiency in many parts of the world.

Understanding the Long-term Implications of Tillage on Water Storage and Corn Yields

NCARS/NCCES Code: 21-15
Funds requested: $4,165

Project Leaders: Alex Woodley, Josh Heitman, Cara Mathers, Charlie Cahoon

Objectives: The researchers aim to understand the effects of long-term tillage practices on soil water dynamics during the upcoming corn season, to determine if water storage and/or water infiltration is the primary reason for historical yield differences that have been otherwise unaccounted for. In addition, the researchers hope to prepare the long0term trial for overdue management updates and future studies on appropriate cover crop selections for corn-soybean rotations in the Piedmont region of North Carolina.

Project Description and Relevance:

Climate change is predicted to both increase mean global temperatures and specifically in the southeastern US, to reduce the frequency but increase the intensity of rainfall events. Under this new climate regime, producers will face greater crop water stress and potentially suffer yield losses. Appropriate management choices will be key to mitigating future stress. This study aims to determine whether conservation tillage in the Piedmont region has maintained higher corn yields due to primarily to increased infiltration and reduced evaporation, rather than by changes associated with soil health within the whole root zone, which appear to be limited based on previous studies at the site.

Management of Plant Parasitic Nematodes in North Carolina Corn Production

NCARS/NCCES Code: 21-16
Funds requested: $8,500

Project Leader: Adrienne M. Gorny

Objectives:

The goal of this project is to identify optimal nematode management practices for corn growers in North Carolina, with a particular emphasis on the Coastal Plains region. The specific objectives of this project are to:

1. Identify the nematode genera most impactful to corn production in the Coastal Plains of North Carolina.

2. Assess in-furrow and seed treatment nematicides for suppression of plant-parasitic nematodes in corn production, with target nematodes including Southern root-knot, stubby-root, stunt, sting, and lesion nematodes.
3. Deliver high-quality Extension and outreach materials regarding the diagnosis and management of these plant-parasitic nematodes in corn in North Carolina.

Project Description and Relevance:

Background and Relevance

Plant-parasitic nematodes pose a significant limitation to corn production in North Carolina and the Southeastern United States. Several genera of plant-parasitic nematode are yield limiting pathogens of corn, including Southern rood-knot, stubby-root, stunt, sting, and lesion nematodes. No host resistance is known to these nematodes, which means corn hybrids commonly grown are susceptible to infection by these nematodes. Thus, management options are limited to crop rotation, cultural practices, and chemical control options. Investigation into optimizing the use of chemical control tactics will support nematode management decisions and economically sustainable corn production.

Research Approach

Nematicide chemical control options will be tested in on-farm field trials. Two field sites with naturally high populations of plant-parasitic nematodes will be identified prior to trial establishment through partnership and guidance of local county Extension agents.

Yield and Cost Comparison of Non-Bt and Bt Hybrids

NCARS/NCCES Code: 21-17
Funds requested: $10,000

Project Leaders: Dominic Reisig, Zach Brown, Nick Piggott, Rod Rejesus

Objective:

1. To train county agents on corn agronomy and corn pests
2. To quantify the cost difference in growing non-Bt and Bt corn (including risk of yield loss and 'hassle')
3. To increase planting of refuge (non-Bt) corn.

Project Description and Relevance:

Bt hybrids have been planted by North Carolina growers since 1996. Bt corn, depending on the type of Bt proteins expressed, can be effective for additional suite of pests such as fall armyworms, southwestern corn borer, lesser cornstalk borer, sugarcane borer and corn earworm. For example, the most common pest of corn in North Carolina, corn earworm, does not limit yield in timelyplanted corn.

Because North Carolina corn growers are in a cotton-producing state, they are required to plant a total of their corn acres to equal at least 20% non-Bt corn hybrids. This is to delay the development of resistance to both corn pests, as well as cotton pests. However, most corn growers in North Carolina and other areas, do not plant the required refuge. The reasons for this are complex, but one is a perceived gap between the yield potential of available Bt and non-Bt corn hybrids.

This proposal attempts to remedy this gap in North Carolina (and virginia). Working with the closest Bt and non-Bt-relevant hybrids available that control corn earworm, the researchers' hypothesis are that:

1) Pest pressure will vary across North Carolina
2) Bt hybrids and non-Bt hybrid 'pairs' will yield differently under high pest pressure
3) Bt hybrids and non-Bt hybrid 'pairs' will yield equally under low to moderate pest pressure.

The researchers will create an economic model (damage abatement model) that incorporates 1) the cost differential of Bt and non-Bt hybrids, 2) the impacts of refuge on Bt resistance, 3) the risk of yield loss in non-Bt hybrids to pests, and 4) non-pecuniary factors. This will help growers know if it is profitable to plant non-Bt refuge.

After yields are collected, changes in net income will be measured for growers (profitability) partial budgets will be calculated for growers switching to non-Bt corn hybrids for varying levels of pest pressure based on the estimated yield differences between Bt and non-Bt corn hybrids.

Environmental Factors Influencing Aflatoxin and Fumonisin Contamination in Corn

NCARS/NCCES Code: 21-18
Funds requested: $7,000

Project Leaders: Carlos Iglesias, James Holland

Objectives:

The objectives of this project are to better understand the environmental factors, including weather, soil characteristics, and management practices, that contribute to ear rots and aflatoxin and fumonisin contamination in maize.

Project Description and Relevance:

The fungus Fusarium vertcilliodes is a world-wide pathogen of maize, causing seedling blight, stalk rot and ear rot. Fusarium ear rot is the most economically significant of these effects, causing yield loss and reduced grain quality. Most importantly, this fungus produces a mycotoxin, fumonisin, linked to animal and human disease.

There are no fungicides labelled for use reduce Fumonisin ear rot. Planting more resistant hybrids is the best option for growers to minimize their risk of fumonisin contamination.

The researchers are still evaluating the effectiveness of the latest breeding approach, and genomic selection. An additional year and a half is needed to finish data collection and analysis to understand how well this method works.

The researchers propose to switch gears and try to understand what are the important environmental factors contributing to fusarium ear rot and aflatoxin and fumonisin contamination.

There are several cooperating locations in corn producing states including Texas, Georgia, Arkansas, North and South Carolina.