

Adapting Corn Production to Climate in the Southeast

Corn Production in the Southeast

Corn is an important row crop in the Southeast. In 2012, field corn was planted on 310, 75, 345, and 330 thousand acres in Alabama, Florida, Georgia, and South Carolina, with the production of 28.9, 4.5, 55.8, and 37.8 million bushels and an average yield of 98, 112, 180, and 122 bushels per acre, respectively. Although corn fields are spread out throughout the Southeast, its production is concentrated in the northern part of Alabama, the upper Coastal Plain of Georgia, the Florida Panhandle, and the central and eastern districts of South Carolina.

Variability in rainfall and temperature affects crop yield by influencing both plant growth and development rates and pest and disease dynamics. The variability in climate in the Southeast is mainly linked to ENSO, an oscillation between warm and cold phases of sea surface temperature in the Equatorial Pacific with a cycle period of 3-7 years. The ENSO phase El Niño results in lower winter temperatures and higher winter-spring rainfall. The ENSO phase La Niña causes warmer and drier conditions from fall to spring.

Based on predictions of ENSO before the planting season starts, you may wish to adopt the strategies below to cope with the expected climate that will occur with each ENSO phase.

Key Climate Impacts and Management Strategies

Impact	Strategy
Drier/warmer spring	
Yield	
<ul style="list-style-type: none"> Warmer temperatures and increased sunshine early in the season lead to higher yields. 	
Insect pests	
<ul style="list-style-type: none"> Increased population of stinkbugs. Increased lesser cornstalk borer damage on corn grown on lighter soils, especially if planted late. 	<ul style="list-style-type: none"> Additional scouting is needed. Avoid light soils if possible. Plant early.



Key Climate Impacts and Management Strategies

Impact	Strategy
Drier/warmer spring	
Insect pests	
<ul style="list-style-type: none"> Increased chinch bugs, mainly on the crops with reduced tillage following grassy winter crops or weeds. 	<ul style="list-style-type: none"> Additional scouting is needed.
Diseases	
<ul style="list-style-type: none"> Increased risk to charcoal rot. 	<ul style="list-style-type: none"> Plant no-till or strip till corn early.
<ul style="list-style-type: none"> More outbreak of southern corn rust. 	<ul style="list-style-type: none"> Scout and treat as needed with a fungicide.

Impact	Strategy
Wetter/cooler spring	
Yield	
<ul style="list-style-type: none"> About 20% less than average yield due to more floods, less germination, less sunshine, and freeze injury. 	<ul style="list-style-type: none"> Delay planting until soil temperature reaches 55 °F.
Insect pests	
<ul style="list-style-type: none"> Greater risks of true armyworms. 	<ul style="list-style-type: none"> Increased scouting is needed.
<ul style="list-style-type: none"> More cutworms damaging seedlings in conservation tillage. 	<ul style="list-style-type: none"> Supplement seed treatments with a broadcast insecticide spray at planting.
<ul style="list-style-type: none"> Fewer chinch bugs and stinkbugs. 	
Diseases	
<ul style="list-style-type: none"> More risk to seedling blight. 	<ul style="list-style-type: none"> Delay planting to promote germination and seedling growth.
<ul style="list-style-type: none"> Increased outbreak of southern and northern corn leaf blight as well as southern rust. 	<ul style="list-style-type: none"> Scout and treat as needed with a fungicide.
Nutrients	
<ul style="list-style-type: none"> More leaching losses of nitrogen and potassium. 	<ul style="list-style-type: none"> Split applications to increase efficiency.
<ul style="list-style-type: none"> Reduction in phosphate uptake. 	<ul style="list-style-type: none"> Band starter fertilizer two inches to the side and two inches below the seed.

Key Climate Impacts and Management Strategies

Impact	Strategy
Drier/warmer summer	
Yield	
<ul style="list-style-type: none"> Low yield due to water stress and excessive heat during pollination and grain-filling stages. 	<ul style="list-style-type: none"> Plant corn early to avoid low rainfall and high heat periods during the summer. Apply irrigation. Use cover crops to storage to keep soil moisture.
Diseases	
<ul style="list-style-type: none"> High risk to aflatoxin contamination. 	<ul style="list-style-type: none"> Plant corn early, fertilize according to soil test recommendations, use recommended seeding rate of adapted corn variety, irrigate, and apply Afla-Guard.

Impact	Strategy
Wetter/cooler summer	
Yield	
<ul style="list-style-type: none"> Larger yields due to more rainfall at silking and tasseling, the critical stages of water requirement. 	<ul style="list-style-type: none"> Increase planting density and nitrogen dose to take advantage of more favorable moisture.
Insect pests	
<ul style="list-style-type: none"> Fewer chinch bugs and fall armyworms. 	
Diseases	
<ul style="list-style-type: none"> Increased risk to southern rust, southern corn rust, and northern corn leaf blight. 	<ul style="list-style-type: none"> Scout and apply fungicides as needed.

Impact	Strategy
Drier/warmer winter	
Insect pests	
<ul style="list-style-type: none"> Increased survival of stink bugs and chinch bugs. 	<ul style="list-style-type: none"> Additional scouting is needed.
Nematodes	
<ul style="list-style-type: none"> Southern root-knot nematode may remain active for longer periods in late fall/winter, thus increasing in number and becoming active earlier in the following year. 	<ul style="list-style-type: none"> Collect a soil sample for a nematode assay from fields going into corn in fall to early winter. Treat with nematicide based on the results of nematode soil assay.

Seasonal Climate Variability Affecting Corn Production in the Southeast

- The ocean-atmospheric phenomenon associated with unusually warm water forming occasionally across the eastern and central Pacific is referred to as the El Niño phase.
- The La Niña phase is characterized by cooler than average sea surface temperatures across the same region.
- The phenomenon associated with close-to-average sea surface temperature in this region is referred to as the Neutral phase.
- El Niño, La Niña, and Neutral are the three phases of ENSO, the El Niño-Southern Oscillation. In the Southeast, the ENSO phenomena affect rainfall and temperature during fall, winter, and spring months.
- Winters and springs are wetter and cooler than normal in El Niño phase years, but drier and warmer than normal in La Niña phase years.
- La Niña summers are often rainier and cooler than El Niño summers because of increased tropical storm activity, which is usually suppressed by El Niño.
- Corn is most susceptible to water stress at tasseling which occurs during the summer in the Southeast. La Niña phase years have larger yields than average years. This is mainly due to the summer rainfall which tends to be higher in La Niña phase years. El Niño phase years, in contrast, have lower yields because they receive less rainfall during this period. Low precipitation especially in July, the warmest month of the year, reduces corn yield substantially.
- High maximum temperatures during tasseling and grain filling periods also reduce corn yield substantially. Higher temperatures shorten grain filling period. La Niña phase years have larger yields than neutral or El Niño phase years because La Niña phase years tend to be cooler during summer.
- The effect of ENSO on corn yield is more pronounced in the southern than in the northern parts of the Southeast.
- In Alabama, the Neutral phase has the largest yields of all ENSO phases throughout the state. El Niño phase produces larger yields than La Niña phase in the southern part, whereas La Niña phase results in larger yields than El Niño phase in the northern part.
- In Florida too, the largest yields are associated with the Neutral phase. Yields in La Niña phase years are usually larger than those in El Niño phase years.
- In Georgia, the largest yields are during the Neutral phase in both northern and southern locations. In the southern part, the major corn production region, yields are larger in El Niño than in La Niña phase years.
- Also in South Carolina, the neutral phase has the largest yields of all ENSO phases. In the central and eastern districts, the major corn production area in the state, yields in El Niño phase years are larger than those in La Niña phase years.

Resources:

- Tools: <http://agroclimate.org/tools.php>
- ENSO and Climate Impacts: <http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ENSO/composites/>

Authors:

Prem Woli, Research Fellow, and **Brenda V. Ortiz**, Assistant Professor and Extension Specialist, Agronomy & Soils Department, Auburn University; **Kathy Flanders**, Professor and Extension Entomologist, and **Austin Hagan**, Professor and Extension Plant Pathologist, Entomology & Plant Pathology Department, Auburn University; **Bob Kemerait**, Associate Professor and Extension Specialist, Plant Pathology Department, The University of Georgia; and **David Wright**, Professor and Extension Specialist, Agronomy Department, University of Florida.