Southeast Climate
EXTENSION | Advancing Climate Extension in Agriculture

Adapting Wheat Production to Climate in the Southeast

Wheat Production in the Southeast

Soft red winter wheat is a major crop in the Southeast US. In 2012, this crop was planted in 220, 20, 290, and 235 thousand acres in Alabama, Florida, Georgia, and South Carolina, with the production of 11.2, 0.6, 11.3, and 11.7 million bushels and an average yield of 59, 41, 49, and 53 bushels per acre, respectively. Although wheat fields are spread out throughout the Southeast, its production is concentrated in the northern and coastal areas of Alabama, the upper Coastal Plain of Georgia, Florida Panhandle, and the central and eastern parts of South Carolina.

Variability in rainfall and temperature affects crop yield by influencing both plant growth and development rates and pest and disease dynamics. Climate in the Southeast varies widely from year to year, which 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. El Niño, an ENSO phase, results in lower winter temperatures and higher winter-spring rainfall. La Niña, another phase, 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 winter and spring	
Yield	
▪ Late planting results in yield losses. Higher losses for late than early maturity varieties are mainly due to the lack of vernalization.	▪ Avoid planting later than the recommended date for your area.
▪ Yield losses especially in coastal areas if grown on sandy loam soils with low water holding capacity.	▪ Reduce the area planted in these areas.

USDA United States Department of Agriculture National Institute of Food and Agriculture

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Key Climate Impacts and Management Strategies

Impact	Strategy
Drier/warmer winter and spring	
Yield	
▪ Yield losses due to shorter growing season and grain-filling period, lack of vernalization, and increased leaf senescence.	▪ The yield loss is associated mainly with late planting. Thus, plant early maturity varieties.
▪ Early planting of early maturity varieties results in lower yields due to accelerated growth and development and spring freeze injury. Late planting of late varieties causes lower yields due to insufficient vernalization. Long-day photoperiod varieties have low yield and grain quality due to early flowering and short grain-filling period. Late heading results in grain filling under hot and dry conditions, which leads to lower yields.	▪ Plant late maturity varieties first and early maturity varieties last.
Insect pests	
▪ Higher likelihood of larger Hessian fly populations.	▪ Avoid early planting. Plant at the recommended time for your location. Plant Hessian fly resistant varieties. Avoid planting wheat after wheat. More intense scouting for Hessian fly is needed.
▪ Increased populations of grain aphids.	▪ More intense scouting for aphids is needed.
▪ Increased populations of grasshoppers.	▪ Scout wheat at heading and treat if grasshoppers are clipping heads.
Diseases	
▪ Increased outbreak of barley yellow dwarf virus (BYDV) due to more aphids.	▪ Avoid early planting. Extra scouting is needed for aphids.
▪ Reduced risk of rust diseases and glume blotch.	▪ Scout at jointing to flag leaf emergence to assess disease risk.
Impact	Strategy
Wetter/cooler winter and spring	
Insect pests	
▪ More occurrences of true armyworm caterpillars and winter grain mites	▪ Additional scouting is needed for these insect pests.
Diseases	
▪ Increased occurrence of the soilborne wheat mosaic disease in southern areas.	▪ Follow crop rotation, use resistant varieties, and plant at the recommended time for your location.
▪ Increased occurrence of the wheat spindle streak soilborne mosaic disease.	▪ Follow crop rotation, use resistant varieties, and plant at the recommended time.

Key Climate Impacts and Management Strategies

Impact	Strategy
Wetter/cooler winter and spring	
Diseases	
▪ Increased outbreaks of glume and leaf blotch, rust, black chaff, and take-all diseases.	▪ Follow crop rotation, use resistant varieties, plant at the recommended time, scout at jointing through head emergence to determine need for fungicides, and carry out seed dressing.
▪ Increased risk of head scab when wetter conditions occur at flowering.	▪ Perform deep tillage, use clean seed, use resistant/tolerant varieties when available, and apply fungicides based on head blight risk (http://www.wheatscab.psu.edu/).

Impact	Strategy
Drier/warmer summer	
Insect pests	
▪ More fall armyworms are likely to attack in fall.	▪ Extra scouting is needed for armyworms.
▪ More aphids, the vectors of BYDV, are possible the following wheat season.	▪ Extra scouting is needed for aphids.

Impact	Strategy
Wetter/cooler summer	
Insect pests	
▪ Possible increase of Hessian flies due to more available moisture during August-September.	▪ Avoid early planting. Plant at the recommended time. Plant resistant varieties. Avoid planting wheat after wheat. More intense scouting needed.

Impact	Strategy
Drier/warmer fall	
Insect pests	
▪ Increased populations of Hessian flies.	▪ As mentioned above.
▪ Increased populations of aphids.	▪ Extra scouting is needed.

Impact	Strategy
Wetter/cooler fall	
Insect pests	
▪ Winter grain mites may possibly be worse.	▪ Extra scouting is needed for this insect pest.

Seasonal Climate Variability Affecting Wheat Production in the Southeast

- The ocean-atmospheric phenomenon associated with unusually warm water that occasionally forms across the tropical 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 equatorial eastern and central Pacific.
- 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 tend to be wetter and cooler than average condition during El Niño phase years and drier and warmer during La Niña phase years across the Southeast.
- Temperature and precipitation are key weather variables determining growth, development, and yield of wheat. Due to lower temperatures during growing season, El Niño phase years generally result in larger yields. La Niña years, in contrast, have smaller yields due to higher temperatures during the season. Higher temperatures lead to shorter growing season, shorter grain-filling period, lack of vernalization, and increased leaf senescence. Higher temperatures in February, however, are beneficial due to an enhancement of early development, following vernalization.
- In Alabama, the La Niña phase results in higher wheat yields in the northern part of the state, whereas the El Niño phase tends to produce more yields in the southern part.
- In Florida, 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 in the major wheat production region, the upper Coastal Plain, are in the El Niño phase years. The smallest yields in this region are in the La Niña phase years.
- In South Carolina, the Neutral phase has the largest yields of all ENSO phases. In the central and eastern districts, the major wheat production area in the state, yields in La Niña phase years are larger than those in El Niño phase years. In the southern part of 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/

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