

Managing Irrigation for Cotton and Peanut Quality and Yield:

A Resource Guide

Photo courtesy of the University of Georgia

► HITTING THE IRRIGATION SWEET SPOT

Irrigation management can be tricky. If rain events aren't reaching your fields during the right stages of growth, soils will progressively become drier, crops will become stressed and it will impact yield. The more information you have available to guide your irrigation decision-making, the better chance you have to hit the sweet spot – that balance between irrigating the right amount at the right time – to achieve the highest quality and yield.

Use this guide to learn more about the importance of irrigation scheduling and how it can improve cotton and peanut quality and yield. Then be sure to schedule a time to meet with a local water management expert who can help you implement an irrigation scheduling program while keeping budget in mind.



"I'm always looking for new tools to address our soil variability. Water in our sandier soils will percolate through much more rapidly, so we must irrigate those areas much differently than with heavier soils. Irrigation scheduling and variable rate irrigation (VRI) can help get the right amount of water to the crop." – Casey Cox, Southwest Georgia peanut farmer

► VARIABLE SOIL IMPACTS WATER RETENTION

Soil types in southern Georgia are highly variable even within a field. If you have a sandier soil, which has larger particles, it's not going to hold water very well. For the plant, this means water is going to either be used rapidly or be lost through evaporation. A silt or clay soil has much smaller particles and a higher water holding capacity, so moisture will be available to the plant longer.



"In southern Georgia, more and more growers are realizing that rainfall patterns are changing. For our growers to remain financially viable and stay in this business, they just about have to manage their irrigation and use the scheduling tools that are now available to be as efficient with their water use as possible."

– Calvin Perry, University of Georgia Extension irrigation specialist

► UNPREDICTABILITY OF RAINFALL EVENTS

Just like with soil, there's a lot of variability in Georgia's rainfall patterns and the geospatial distribution of rainfall events. Georgia receives, on average, about 52 inches of rainfall a year, and it takes about 22 to 24 inches of water to grow peanuts and cotton. The problem is when, where and how the rainfall events occur. Pop-up storms can bring two to five inches of rain to one field over several hours, and a field down the road might get two-tenths of an inch of rain out of the same storm or miss the storm completely.

Growers who don't use proper irrigation management techniques can see stressed crop conditions in as quick as a one-week dry spell. Depending on where the crop is at in its life cycle, this can result in a significant yield reduction. Growers can benefit from irrigation scheduling tools that show exactly what's going on in every field.

► CONFIDENCE THROUGH IRRIGATION SCHEDULING

Some growers tend to irrigate on a regular schedule - "I always irrigate Mondays and Fridays," or some wait until they see crop stress. However, more and more growers are starting to adopt advanced scheduling methods and are seeing the benefits.

Advanced irrigation scheduling tools:

- **Free apps** - use weather station data to very accurately advise growers when they need to irrigate their crop and how much

- **Soil moisture sensors** – use a direct measurement of available moisture at several depths in the soil root zone
- **Variable rate irrigation (VRI)** – hardware is added to the center pivot system that enables a grower to tailor application amounts to management zones that determine where and how much water to apply

Most systems offer a data dashboard that indicates how much water needs to be applied to refill the soil profile for plant growth. They also offer remote telemetry, transmitting data from the field to a website or app. This app capability translates into a considerable time saving opportunity by reducing daily field visits to weekly or bi-weekly visits through the delivery of more precise information straight to the farmer.

► DROUGHT STRESS REDUCES COTTON YIELD AND QUALITY

Cotton yield and fiber quality can vary substantially across Georgia with some growers harvesting 500 lbs./acre and others harvesting up to 2,000 lbs./acre. Fiber quality is correlated with yields, especially fiber length and strength. No matter what kind of weather the season brings, proper irrigation management can ensure your crop will receive the right amount of water during cotton's critical growth stages. This will make sure the crop reaches its quality and yield potential.

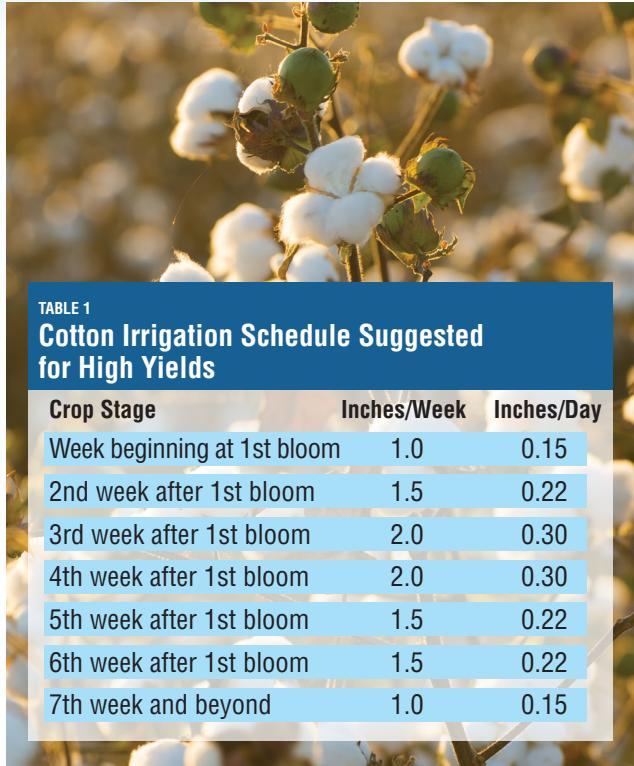
Proper irrigation management saves the farmer time and money through targeted water application. Because of that efficiency, water and nutrients

► “There’s definitely a benefit to optimizing the water we can control with irrigation. It ensures that we’re not exacerbating the problem of any diseases and pests.”

– Casey Cox, Southwest Georgia peanut farmer



"When managing for higher yields, you're usually going to produce better fiber quality. To maximize water use efficiency, whether it's rainfall or irrigation, it's important for growers to have access to irrigation when they need it." – John Snider, University of Georgia crop and soil science associate professor



Crop Stage	Inches/Week	Inches/Day
Week beginning at 1st bloom	1.0	0.15
2nd week after 1st bloom	1.5	0.22
3rd week after 1st bloom	2.0	0.30
4th week after 1st bloom	2.0	0.30
5th week after 1st bloom	1.5	0.22
6th week after 1st bloom	1.5	0.22
7th week and beyond	1.0	0.15

2019 Georgia Cotton Production Guide. University of Georgia.

can work together to avoid loss of both through runoff and/or dilution. Applying the right amount of water at the right time to the right place maximizes the crop's ability to absorb the nutrients the soil is holding. Too much water spreads out those nutrients to the point where the crop is no longer getting what it needs, and farmers are losing their inputs investment.

Because cotton is an indeterminate crop, it produces fruit at different but predictable stages during the growing season. The timing of stress events during development impacts fiber quality.

Research shows that if a drought occurs from first flower to peak bloom period, it

will significantly reduce fiber length. It takes about 20 days for fiber elongation to occur. Once the drought has lifted, if there's enough carbohydrates available to those fibers, shorter, thick fibers will develop during the thickening phase, allowing the fiber to get really strong. While a strong fiber is important, those fibers are shorter and thicker which reduces overall fiber quality.

When large rain events happen, only a portion is considered effective rainfall because the soil can only hold so much water and the rest will runoff. If the crop goes a week without water, it can have a substantial impact on crop yield.

According to the University of Georgia, a water deficient crop during early flowering can cause a yield loss of up to 60%, relative to a well-watered crop. Drought stress during squaring to flowering, at peak bloom, and from peak bloom to harvest can cause up to a 35% yield loss at each of these growth stages.

A dominant contributing factor to higher yields is high boll density (the number of bolls per unit land area). University studies show that when drought stress occurs, either a smaller plant is produced with fewer fruiting sites, or there's plenty of fruiting sites but drought stress causes the plant to shed them. In both scenarios, the result is fewer bolls per unit land area, which is the key factor in cotton yield loss.

Conservation tillage practices can help mitigate drought conditions and reduce



TABLE 2
Peanut Irrigation Schedule

Week of Growing Season	1.5 inches/ week maximum	2.0 inches/ week maximum
0-4	0.1-0.2	0.1-0.2
5-6	0.5	0.75
7-9	0.75	1.0
10-12	1.5	1.5
13-17	1.5	2.0
18-20	0.5	0.75

The 1½ inches per week irrigation schedule is recommended when available water is limited or there is above average rainfall. Otherwise, the 2 inches per week schedule is recommended.

overall water use by 15%, saving farmers resources and money. Farmers who use conservation tillage have greater water holding capacity than conventionally tilled soils. Using irrigation scheduling, conservation irrigation maximizes the retention of nutrients, making them more available for plant uptake. It also ensures that the crop receives the proper amount of water to produce a stress-free, quality product.

► TOO MUCH OR TOO LITTLE WATER CAN IMPACT PEANUT QUALITY AND YIELD

Historically, about 23 inches of water was considered the required amount of moisture for peanuts from planting to harvest, however new research conducted at the University of Georgia suggests that 18 inches of water is optimal. About 14 to 16 inches of water is needed — either from rainfall or irrigation — from weeks 10 to 17 of the 20-week peanut growing season.

For the peanut crop, too much water, whether it's from too much rainfall or over irrigation, can cause heightened disease and pest pressure. Moist, humid conditions can be a breeding ground for molds and fungi and leave the peanut crop vulnerable to crop stress.

Too little water has a similar impact, resulting in the development of aflatoxin which can impact yield and quality. A water deficient crop can also impact plant vigor and health, which can damage the grade and quality of the peanut and yield.

Proper water application during the 7- to 15-week growth period is critical for a successful peanut crop. If the crop receives too little water, many of the pegs never become peanuts, and yield is reduced. In addition, immature pods are typical when the crop is under watered.

Conservation irrigation and conservation tillage practices improve a farmer's opportunity to grow a healthy crop. Irrigation scheduling helps balance water applications and can lessen concerns of poor peg formation. Due to their precision, soil moisture sensors and VRI take the guess work out water application and ensure your crop is getting the moisture it needs during specific growth stages. They also save countless hours driving out to checks fields' soil moisture. With connected apps and dashboards, a farmer can check everything on their smartphone or office computer. Additionally, conservation tillage and cover crops can build organic matter and soil tilth and trap soil moisture to improve water availability.

IRRIGATING PEANUTS – FINE LINE TO FOLLOW

University of Georgia research observations indicate that too much water reduces peanut yield.

Research from 2014 showed that overirrigating the crop reduced yields by approximately 1,500 lbs./acre. When following the checkbook method, about 15 inches of irrigation were applied to the field was applied about 15 inches of irrigation during a dry year, which produced a yield of about 5,000 pounds. When following a soil moisture sensor-based method, the field was irrigated with about 9 inches of irrigation and yielded about 6,600 lbs./acre.

15
inches of
Irrigation



5,000
lbs./acre



9
inches of
Irrigation



Checkbook Method

Soil Moisture Sensor Method



“There is a fine line in peanuts, of course, under watering causes significant yield reductions. However, if the crop is over watered, yield is also reduced. More than six years of research data show if the crop is not properly irrigated yield is reduced.”

– Wes Porter, University of Georgia Extension Precision Ag and Irrigation Specialist

Let your local irrigation experts help you make the most efficient water management decisions for your farm operation. To request a free on-farm consultation from the Southeast Aquatic Resources Partnership (SARP) and the Flint River Soil and Water Conservation District, call 913-438-0771 or email SARP@trustinfofood.com today.

You can also go online to learn more about irrigation scheduling practices and request a free on-farm consultation by visiting www.trustinfofood.com/irrigationstation.



Southeast Aquatic Resources Partnership (SARP) is a regional collaboration of natural resource and science agencies, conservation organizations and corporations working together to strengthen the management and conservation of aquatic resources in the southeastern United States.

The Flint River Soil and Water Conservation District is a state agency based in southwest Georgia dedicated to the stewardship of natural resources for future generations and the exploration of conservation-driven technologies and strategic partnerships that enhance agricultural sustainability.



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