



# PHYSIOLOGY TODAY

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## Late Planted Cotton

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*This year rain and flooding in the Mid-South delayed cotton planting into late May and early June. The Mid-South crop was planted later than any previous crop in the last 20 years. This newsletter is taken from a new publication that reviews the cotton planting situation in the Mid-South and explores the possible outcomes in yield and quality. This publication, co-authored by the Extension Cotton Specialists in the Mid-South, also reviews the management of late planted and variable stand cotton. Although this issue focuses on the current situation in the Mid-South, the information applies to almost all regions of the cotton belt. For a copy of "Late Planted Cotton: Situation, Physiology and Management" contact NCC, Memphis (KH).*

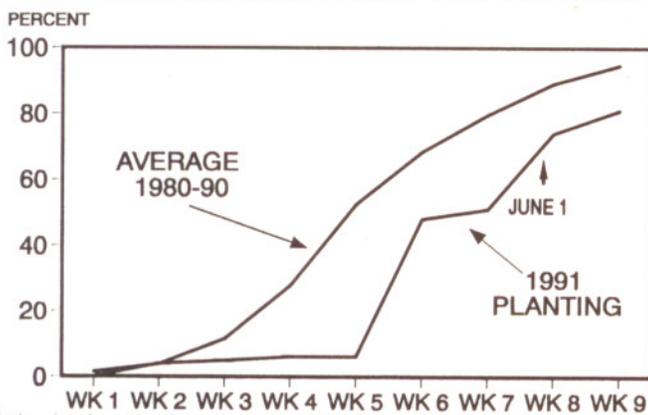
### Situation Analysis

Throughout the Mid-South, the 1991 planting season suffered severe delays due to excessive rain from mid-April to mid-May. The following figures reveal the delay in the 1991 crop compared to the average of the previous years.

### Louisiana Planting Period

The 1991 planting year was only 1 week ahead of 1975, the latest planting season during the last 20 years. The 1975 Louisiana cotton crop was approximately 50% planted as of week 7. In 1991, cotton reached the 48% planted level on week 6 (May 26), compared to a 10 year average of 68% at this time. By June 9, nine weeks from the normal start of planting, Louisiana was still 14% behind normal, at 81% planted.

### LOUISIANA COTTON PLANTINGS

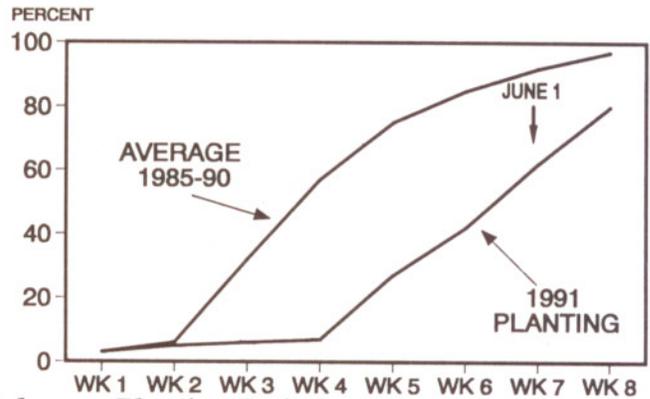


### Mississippi Planting Period

Mississippi cotton planting is now estimated to have suffered the greatest delay in the last 20 years. At the end of week 4, halfway through the normal planting period, only 7% of the intended crop had been

planted, compared to a six year average of 57%. The Mississippi cotton crop was planted 3 weeks later than the previous 5 year average.

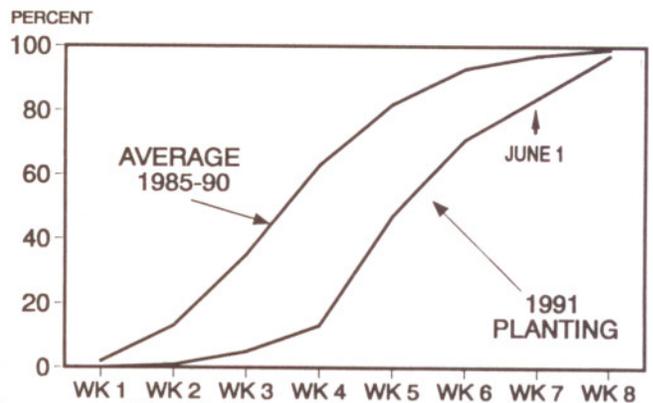
### MISSISSIPPI COTTON PLANTING



### Arkansas Planting Period

Arkansas cotton plantings have lagged behind normal since the onset of the 1991 season. At the end of the fourth week of the normal season, planting was 13% complete, compared to a six year average of 63%. Planting then progressed somewhat faster achieving 71% complete by the end of week 6, compared to a six year average of 93%. As of June 9, planting had reached 97% of intended acreage, slightly behind a six year average of 99%.

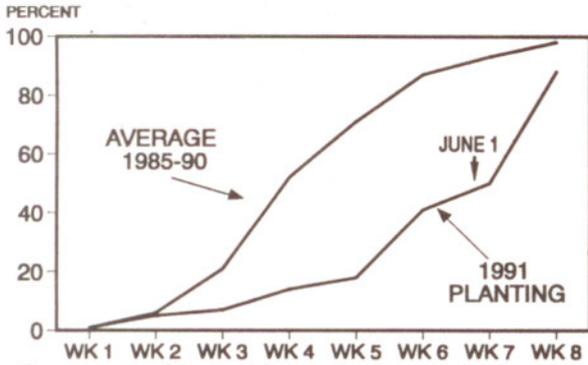
### ARKANSAS COTTON PLANTING



### Tennessee Planting Period

By the 2nd week of planting, Tennessee had fallen behind the 5 year average. By late May, Tennessee had the distinction of being the latest region in cotton planting progress. In week 6 of the planting season, Tennessee had planted only 18% of the intended acreage, compared to a six year average of 71%. The following week saw some improvement as 41% was planted, compared to a six year average of 87%. By June 9, USDA estimated that Tennessee had planted 88% of the intended cotton acres.

# TENNESSEE COTTON PLANTING



**Development of Late Planted Cotton**

The following figure provides a chronology or "time-line" for cotton's development with several different planting dates in the central Mid-South. These dates are only estimates using average weather conditions. Actual field conditions will vary widely.

As cotton is planted later, the time required for the plant to develop squares and blooms decreases, due to the warmer days. However, at the end of the season, late planting pushes boll development into the cooler weather, lengthening the number of days required from bloom to open boll. As a result, it takes approximately the same number of days (150) to bring a late-planted crop to harvest as it does a mid-planted crop.

Cotton that was planted on June 1 would be expected to have pin head squares on June 25 and 1st bloom on July 20. The effective bloom period would continue until August 25, after which date there is a negligible chance that a bloom will mature to a harvestable boll. In the southern-most part of the Mid-South, the effective bloom date may continue until September 5, while in the northern-most part, only August 15. For this June 1 planting, bolls will start to open on September 15, with harvest potentially starting on October 15.

## Frost and Freeze Damage to Cotton

Although we do not have a full understanding of the temperature requirements to mature bolls, we observe that bolls will continue to mature and open even when temperatures are below 60°F. The process of defoliation is more sensitive to cool temperatures than boll opening and is usually the limiting factor in spindle-harvested regions. Defoliation slows to a halt when temperatures do not climb above 60°F.

Frost injury to cotton occurs when air temperature drops to 36 to 37°F, depending on microclimate effects such as wind speed and air drainage. Frost damage is most severe in low spots of the field on nights with cool, dry, still air. Frost damage will injure the leaves, often only the outside leaves, but cause little boll damage.

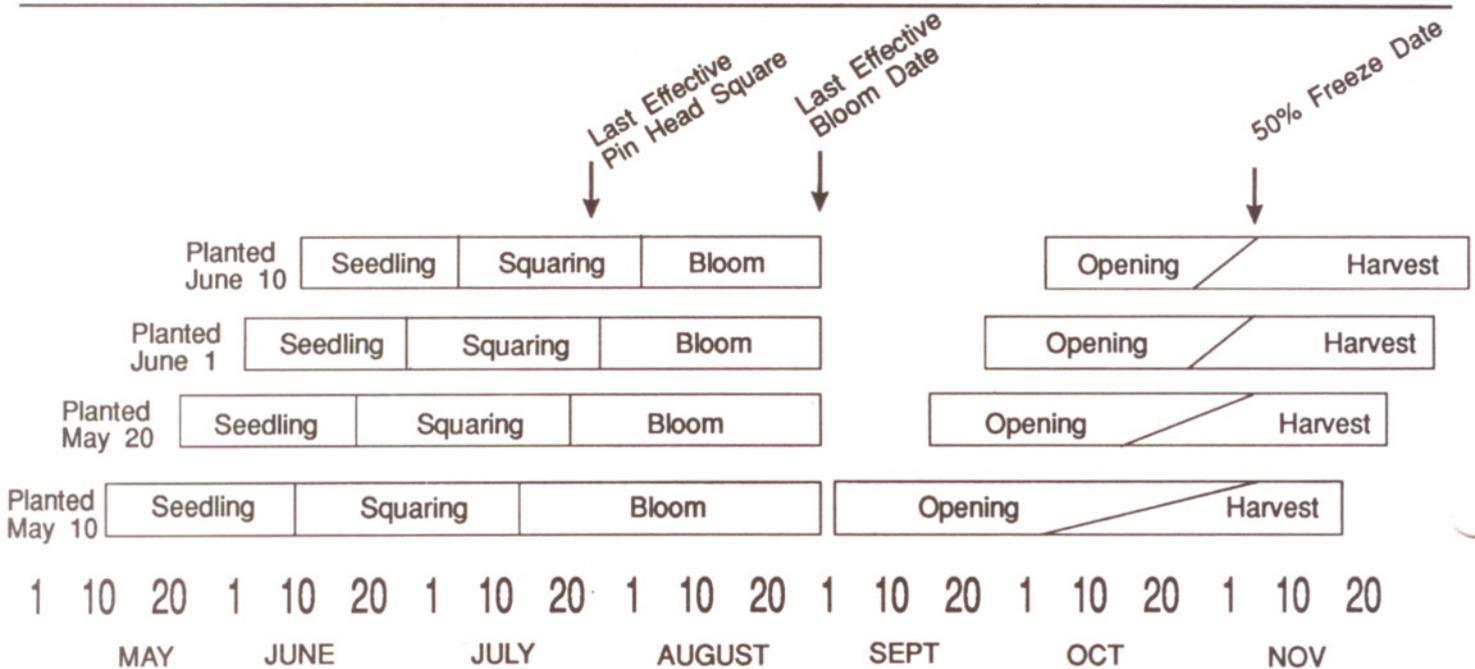
Freeze damage brings a halt to further boll opening and occurs when the air temperature drops below 32°F for several hours. A freeze will cause immature watery bolls to turn mushy the following day and eventually rot. Unopened bolls with mature lint will often crack slightly but not enough for spindles to grab, because the separation zone in the boll wall is killed. Bolls that were in the process of opening should continue to open and be harvestable.

## Vulnerability of a Late Crop to an Early Freeze

Lateness in the Mid-South cotton crop focuses attention on fall weather patterns, especially rainfall and cold temperatures. Freeze probabilities for sites in the Mississippi Delta are shown in the following table.

For example: Near Blytheville, Arkansas, there is a 50% probability that a freeze (32°F) will occur on or before November 11 and a 90% probability that a freeze will occur on or before November 19. The season length from June 1 planting to the 50% frost date is 158 days. Some producers may bet on a late freeze, but the odds are even that a killing frost will occur on or before November 19 in Blytheville. °

**Time Line for Central Mid-South Cotton's Development with Several Planting Dates**



## Freeze Dates and Season Length from June 1

	50%	90%	Days from 6/1 to 50% date
<b>ARKANSAS</b>			
Blytheville	11/6	11/19	158
Dumas	11/8	11/23	160
Helena	11/6	11/23	158
Jonesboro	11/5	11/19	157
Marianna	10/31	11/7	152
Paragould	10/31	11/13	152
Pine Bluff	11/8	11/22	160

## LOUISIANA\*

Bastrop	11/6	11/15	158
Bunkie	11/16	11/25	168
Lake Providence	11/9	11/17	161
Natchitoches	11/10	11/18	162
Saint Joseph	11/3	11/9	155
Shreveport	11/16	11/26	168
Tallulah	10/29	11/4	150
Winnsboro	11/3	11/8	155

\* Louisiana data are 50% and 75% probability.

## MISSISSIPPI

Aberdeen	11/1	11/12	153
Belzoni	10/25	11/22	146
Clarksdale	11/11	11/24	163
Cleveland	11/2	11/14	154
Greenwood	11/9	11/25	161
Hernando	11/7	11/18	159
Holly Springs	10/22	11/5	143
Starkville	11/9	11/20	161
Stoneville	11/8	11/22	160
Tupelo	10/25	11/8	146
University	10/22	11/7	143
Water Valley	10/30	11/11	151
Yazoo City	11/6	11/24	158

## TENNESSEE

Bolivar	10/24	11/8	145
Brownsville	10/29	11/11	150
Covington	10/30	11/13	151
Dyersburg	11/4	11/16	156
Jackson	10/29	11/11	150
Lewisburg	10/20	11/2	141
Memphis	11/7	11/20	159
Milan	10/23	11/4	144
Murfreesboro	10/22	11/04	143
Union City	10/20	11/2	141

## Field Weathering

Late planted fields are vulnerable to field weathering because bolls maturing under cooler weather will open slowly, stretching out the exposure time to adverse weather. In addition, fields with variable stands will be highly vulnerable to weathering because early planted cotton will have open bolls long before the late planted cotton is ready to defoliate.

When mature cotton bolls first open, the lint is white and clean due to the highly reflective nature of cellulose and the lack of microbial degradation. If boll development is stopped prematurely by frost or drought, the lint (prior to weathering) often has a yellow color that varies in intensity. As exposure to moisture increases, fungi start to feed on the surface of the lint. The dark color of the microscopic fungal spores grays and dulls the lint. This gray color is increased when sugar occurs on the lint due to either aphid/whitefly honeydew or natural lint sugars. Cotton lint naturally has a high sugar content just prior to boll opening. When the boll opens under favorable conditions, this sugar disappears, probably becoming fixed in the cellulose matrix. But under humid conditions, this lint sugar provides a starting point for fungi to feed, which results in a mass of fungal hyphae on the lint that create "hard" or "gray lock" bolls.

The deleterious effect of weathering on color is summarized in the following table, with data averaged from 5 sites in the Mississippi Delta. Cotton responds to weathering by graying and decreasing yellowness, just like a fence post. Micronaire and uniformity both decrease due to roughening and weakening of the fiber.

### Effect of Weathering on Yield loss and Lint Quality

	Average Number of Days of Weathering			
	0	8	21	50
Yield loss %	0	2.2	2.7	4.6
Rd reflectance	81.1	79.3	78.2	77.1
+b yellowness	8.4	8.2	7.5	7.2
Length inches	1.10	1.10	1.10	1.09
Uniformity Index	83.4	83.3	82.8	83.0
Strength	25.6	25.4	26.1	25.3
Micronaire	47	47	42	43

(Meredith, 1988)

### Rainfall Patterns and Harvest Dates

Precipitation plays an obvious role in affecting fieldwork capabilities. Research conducted at LSU reveals that for a clay soil in the Bastrop area, the number of available days in which fieldwork can be conducted drops rapidly during October and November. For the central Mississippi Delta, Parvin, Cooke and Spurlock reported on the drop in days and hours fit-for-harvest, and the associated decrease in the acres that could be picked per week. Over a 2 month period, the number of acres that can be picked in a week drops from 220 to 45 acres.

**Days Fit-for-Fieldwork in Bastrop, LA and Days Fit-for-Harvest in Central Mississippi**

Period	Fieldwork days/week	Harvest days/week	Harvest hrs/day	Acres per week
Sep 27-Oct 10	4.8days	4.7days	9 hours	220 acres
Oct 11-Oct 24	4.5	4.2	8.5	185
Oct 25-Nov 7	2.8	3	7.5	115
Nov 8-Nov 21	1.3	1.7	7	60
Nov 22-Dec 5	n.a.	1.4	7	50
Dec 6-Dec 19	n.a.	1.3	7	45

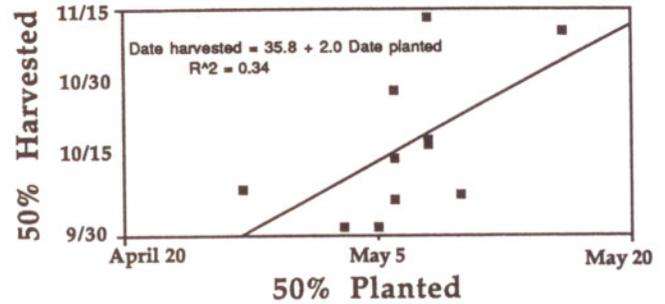
(Olubobokun 1987, Parvin 1989)

The combination of the freeze and days fit-for-fieldwork points to the climatic constraints facing late season cotton. Not only are the number of days available until a likely frost important, the heat units received after planting also play a large role.

**Yield and Quality in Previous Late Planted Years**

The relationships between statewide average planting date versus the average yield, quality or harvest date, provide a glimpse into the 1991 harvest season. The last 10 years of Mississippi cotton production are used to illustrate several principles. During the last 6 seasons, it has taken 155 days on average from the 50% planted date to the 50% harvested date. Late planting usually results in late harvesting, as illustrated in the following figure. Although certain years were planted late, they were harvested in a reasonable time. Based on this relationship, for every day planting is delayed, the harvest is delayed by 2 days. In Mississippi with a

**Mississippi Average**



50% planted date of approximately May 25, we would expect a 50% harvest date for the 1991 crop 1 week before Thanksgiving Day.

Late planting does not necessarily result in low yield or low quality. Within the last 10 years no obvious relationship has existed between average planting date and average quality or yield. Neither does average harvest date appear to relate to average yield and quality. The only relationship that stands out is that both average yield and quality are improving. On average over the last 10 years, the yield has improved in Mississippi 11 lbs per year. The improvement in grade has raised the % strict low middling or better by 4.4 % per year. In years with adverse harvest weather, both yield and quality are reduced. What is certain is that much of the Mid-South crop was planted later than any crop in recent memory. In many respects we are sailing in uncharted waters. Hopefully the crop won't collide with an iceberg from an early freeze. The improvements made over the last 10 years reveal that producers have new tools to produce yield and quality despite adverse weather.

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