2004 BELTWIDE COTTON CONFERENCES, SAN ANTONIO, TX – JANUARY 5-9

YIELD, QUALITY, AND ECONOMIC IMPACTS OF 2002 HARVEST SEASON RAINFALL IN THE MISSISSIPPI DELTA

Thomas B. Freeland, Jr.
USDA
Office of the Chief Economist
World Agricultural Outlook Board
Stoneville, MS
Steven W. Martin and M. Wayne Ebelhar
Delta Research and Extension Center
Mississippi State University
Stoneville, MS
William R. Meredith, Jr.
USDA
Agricultural Research Service
Stoneville, MS

Abstract

Cotton production in the Mississippi Delta is influenced by weather scenarios each year for the final outcome. Weather and weather-related factors are by far the most limiting factors in yield and quality for each cotton crop. Cotton cultivars have been developed in consideration of climate windows that occur in order to take advantage of both precipitation and dry times during the growing season. Management decisions with an economic impact develop when any particular year does not follow near normal weather patterns. Yields are affected for the better or worse depending on the timing of weather events during critical growth stages. In 2002, the Mississippi Delta cotton crop had an excellent profit potential due to near perfect timing of particular weather events, until harvest. Tropical moisture, from the Gulf of Mexico, developed into eleven rain events over ten weeks beginning with the second week of cotton harvest and ending almost a month after the prime harvest window. Yields and quality were drastically reduced from their earlier potential. Final Delta average yield numbers emphasized this potential and outcome. Even with the damage and lateness of the harvest, the Delta was still above the annual state average compared to prior years. If the Delta would have had a near optimal harvest season, there is little doubt that record yields would have been recorded.

Introduction

The cotton crop in the Mississippi Delta in 2002 was progressing throughout the area with exceptional promise. Producers over the entire area were optimistic about the potential of their crop. Environmental conditions throughout the growing season had aided in producing one of the best boll loads through the start of the defoliation season. As defoliants activated and leaves fell, this only heightened the anticipation of the prosperous season. As harvest season began, some of the early yield reports were coming in as excellent, two to four bales per acre. The National Agricultural Statistics Service (NASS) estimated that as of the week ending September 15, 2002, 36% of the state's cotton crop was in excellent condition and 50% was in good condition.

Beginning on September 18, 2002, tropical moisture started developing rain clouds all over the Delta. During the next eight weeks, out of the originally stated 10, in fairly evenly spaced intervals, the Delta saw seven rain events amassing from 8 to over 20 inches of precipitation during the critical cotton harvest season. Yield reports during and after these events dropped drastically compared to the earlier reports. The Mississippi Delta ended the harvest with an above average crop due to the potential that had been present prior to the rains. This paper will document these events and attempt to evaluate and estimate the crop as if no harvest season rainfall had affected it, as well as estimate the economic gain that the Delta would have had if it were able to harvest the crop with no adverse conditions.

This project was not defined or planned prior to the rain events. Several scientists, primarily the co-authors of this paper, identified a situation as it was developing that needed to be documented. The Mississippi Delta was watching its cotton crop being washed away with rain after rain during the most opportune time for harvest. Much of the crop had been defoliated and was deteriorating in quality. During the time when all the researchers were awaiting return to the field to complete harvest, an impromptu discussion was held which resulted in the origination of this project. The project required that weather data be compiled along with yield differences of fields prior to and following rain events. Two sites were selected as only half of each treatment had been harvested prior to the rains and the remaining half of the treatment could be harvested after the rains ended and thus comparable data could be analyzed. The two sites were located at different research locations, on different soils, and research areas of different scientists. One location was a large plot study on a Forestdale/Dundee silty clay loam soil located on the Tribbett Satellite Research Farm near the Tribbett community. From now on, this study will be

referred to as DREC as it was the research of Dr. Wayne Ebelhar, MSU-DREC. The other study was a small plot study, located on Bosket very fine sandy loam soil at Stoneville, MS. This study will from now on be referred to as ARS as it was the research of Dr. Bill Meredith, USDA-ARS.

Starting on September 19, 2002, tropical moisture from the Gulf of Mexico swept into the Southern United States dropping several inches of rainfall over a large area of the South. This rain event deposited 3.67 inches of precipitation at the National Weather Service (NWS) Cooperative Observer Program (COOP) weather station located at the Delta Research and Extension Center, Stoneville, Mississippi. Four days of dry weather after this type of rain event did little to aid harvesters getting back into the fields, especially while all eyes were on Hurricane Isidore in the Gulf. On September 25, 2002, Isidore started to deposit the first rain over the Delta and the COOP site rain gauge at Stoneville collected 4.02 inches of precipitation over the 2-day event.

With over 10 inches of rain in two weeks, flooding problems appeared all over the Delta, and some cotton modules were inundated with floodwaters. Hurricane Lili followed almost the same path only six days later and added to the problem. On October 3, 2002, rain in the Delta measured more than two inches from Lili. Rainfall amounts at the COOP site in Stoneville amassed 2.34 inches in the 2-day event.

The Mississippi Delta received eight additional rain events through the next month (Figure 1). By November 30, 2002, the COOP rain gauge at Stoneville had collected 18.20 inches of rain for the three-month period of September through November. Rain events of 0.23 inches on October 7, 3.08 inches on October 9 to October 11, 0.58 inches on October 19 to October 21, 0.82 inches on October 25 to October 28, 2.64 inches on November 3 to November 6, 0.17 inches on November 15, 0.04 inches on November 18, 0.56 inches on November 25 to November 26 only degraded the situation more. A radar-estimated precipitation image, created by the Yazoo-Mississippi Delta Water Management District (YMD), estimates the total amount of rain that fell in the Mississippi Delta between the harvest dates of the studies (Figure 2).

The longest period of time without rain was eight days and that happened in November, almost a month after the prime harvest period. Some cotton was harvested during these rain events. Mississippi Agricultural Statistics Service (MASS) estimated that only 9% of the crop was harvested prior to the rain events beginning on September 18, 2002. By November 10, 2002, with 35% of the crop remaining in the fields (MASS 2002), the damage had been done. Fifty-six percent of the crop was estimated harvested during the rain events with yields dropping every day. To make matters worse, modules all over the Delta were sitting in mud and water, some for over a month awaiting an opportunity to be picked up by module haul trucks. The quality was declining as more open cotton was weathered and modules soaked up moisture. As quality declined gin costs rose as gins had to slow down decreasing output efficiency. Grades of the cotton seed were coming back as zero (no value for crushing) by the end of the season. Rebates to cooperative members were on the verge of being changed to a charge for ginning.

Materials and Methods

The DREC study was planted in a 4-row plot (40-in spacing) by 100 feet in length with one cultivar ('SG 747') and six fertilization treatments. There were ten replications of the study for a total of sixty plots. The center two rows of each plot were harvested on September 18, 2002, with a 2-row spindle picker, modified for plot harvest. Cotton was bagged, weighed, and grab samples taken in order to determine lint percent and HVI quality.

The two outside rows of the DREC study were harvested in the mud on November 14, 2002, as this was the earliest date that a picker could get back into the field at this location. This date was even a bit too early as the picker had to be pulled out of the mud several times that day. The remaining two rows of each treatment were harvested with the cotton samples weighed, and grab samples taken for ginning and quality determination.

The ARS study was planted with four cultivars ('SG 747', 'DP 555BR', 'FM 966', and 'PSC 355') and no other treatment differences. There were six replications of the study for a total of 24 plots. Each of the 6-foot plots was hand harvested. Each sample was bagged, weighed, and ginned with the lint submitted for HVI classing.

The ARS study was harvested again on November 13th, 2002. Another 6-foot section was hand harvested. Each sample was bagged, weighed, and ginned.

Weather data was collected by the COOP observers at Stoneville, Mississippi as well as numerous other COOP sites across the United States. From September 18, to November 14, 2002, 17.38 inches of precipitation was accumulated. This calculates to 264% of normal precipitation during that time period (Figure 3). Area wide precipitation for that same time period depicts massive amounts of rain accumulations for the majority of the cotton growing areas in the state of Mississippi (Figure 4). These accumulations equate to well over 200% of normal precipitation for almost the entire state of Mississippi during this time period (Figure 5).

Results

The grab samples from both studies were ginned through a 10-saw microgin without seedcotton cleaning and were classed without lint cleaning. All the samples were sent to the USDA, Cotton Classing Office in Dumas, AR, for classing and were evaluated on January 29, 2003. The results of these evaluations are astounding, but when the data are inputted into the Texas A&M, Cotton Inc., 2003 Crop Loan Valuation Program (2003 CLVP) which incorporates the USDA, CCC Loan Schedule of Premiums and Discounts for Upland and ELS Cotton, the implications can be calculated monetarily. Yields for both studies dropped drastically from the pre-rain to the post-rain harvest. Grades came back from the classing office reduced as well. Interestingly, the lint turnout additionally declined.

In the DREC study, the pre-rain yield averaged 4438 pounds of seedcotton per acre with a lint turnout of 40.6% to yield a lint yield of 1803.1 pounds per acre. The DREC post-rain harvest yield was 3096 pounds with a lint turnout of 37.9% which calculates to a lint yield of 1174.3 pounds per acre. The lint yield was reduced by 629 pounds per acre, which translates to a 34.9% reduction as a percent of prior harvest yield. The lint quality data was graded and the median and mode for the pre-rain harvested HVI color was 41 with an leaf of 7. The classing office returned averages for micronaire of 4.99, length of 1.11 inches, and strength of 27.4. The post-rain harvested cotton graded with a median and mode color of 61 and leaf of 7, with an average micronaire of 5.04, length of 1.07 inches, and strength of 25.8.

The ARS study pre-rain harvest lint yield was 1141.8 pounds, per acre. The post-rain lint yield was 921.2 pounds per acre. The lint yield was reduced by 220.6 pounds per acre, which is a 19.3% reduction as a percent of prior harvested yield. The lint quality data was graded and the median and mode for the pre-rain harvest HVI color was an 11, the only 11's graded at Dumas this year, with a leaf of 3. Returned from the classing office was an average micronaire of 4.92, length of 1.16, and strength of 33.8. The post-rain harvested cotton graded with a median and mode HVI grade of 51 and leaf of 3, with an average micronaire of 4.73, length of 1.13, and strength of 31.0.

Yield and quality data were inputted into the 2003 CLVP with interesting results. The pre-rain harvests of the DREC and ARS studies resulted in Lint Value per Acre values of $766 and $650, respectively. Averaged together, they valued $708 per acre. The post-rain harvests of the DREC and ARS studies were valued at $468 and $467, respectively per acre. Averaged together, they valued $468 per acre. The average reduction in value for both studies was $240 per acre. This does not include the reduction in seed value that also occurred, as much of the seed at the end of the ginning season was valued at $ 0.00 per ton.

Conclusions

The Mississippi Delta harvested 795,200 acres of upland cotton in 2002 (NASS 2002). With 35% of the crop harvested after November 10, 2002, and normally only 2% is remaining in the fields at this time (MASS 2002), we can extrapolate that 262,416 acres were adversely affected by the delay in harvest. This resulted in a loss of $62,979,840 in gross income to cotton producers in the Mississippi Delta from the lint value reductions. The additional loss of gross income from the seed value and increased harvesting and ginning costs only increase the total loss for 2002.

References

2003 Cotton Incorporated, Texas A&M, Crop Loan Valuation Program (2003 CLVP)

MASS 2002, United States Department of Agriculture, Mississippi Agricultural Statistics Service, *Weekly Weather Crop Report*. Releases:

- Weekly Crop Weather September 09, 2002
- Weekly Crop Weather September 16, 2002
- Weekly Crop Weather September 23, 2002
- Weekly Crop Weather September 30, 2002
- Weekly Crop Weather October 07, 2002
- Weekly Crop Weather October 15, 2002
- Weekly Crop Weather October 21, 2002
- Weekly Crop Weather October 28, 2002
- Weekly Crop Weather November 04, 2002
- Weekly Crop Weather November 12, 2002
- Weekly Crop Weather November 18, 2002
- Weekly Crop Weather November 25, 2002

NASS 2002, United States Department of Agriculture, National Agricultural Statistics Service, Quick Stats, Internet available data for Districts 10 & 40 of Mississippi.

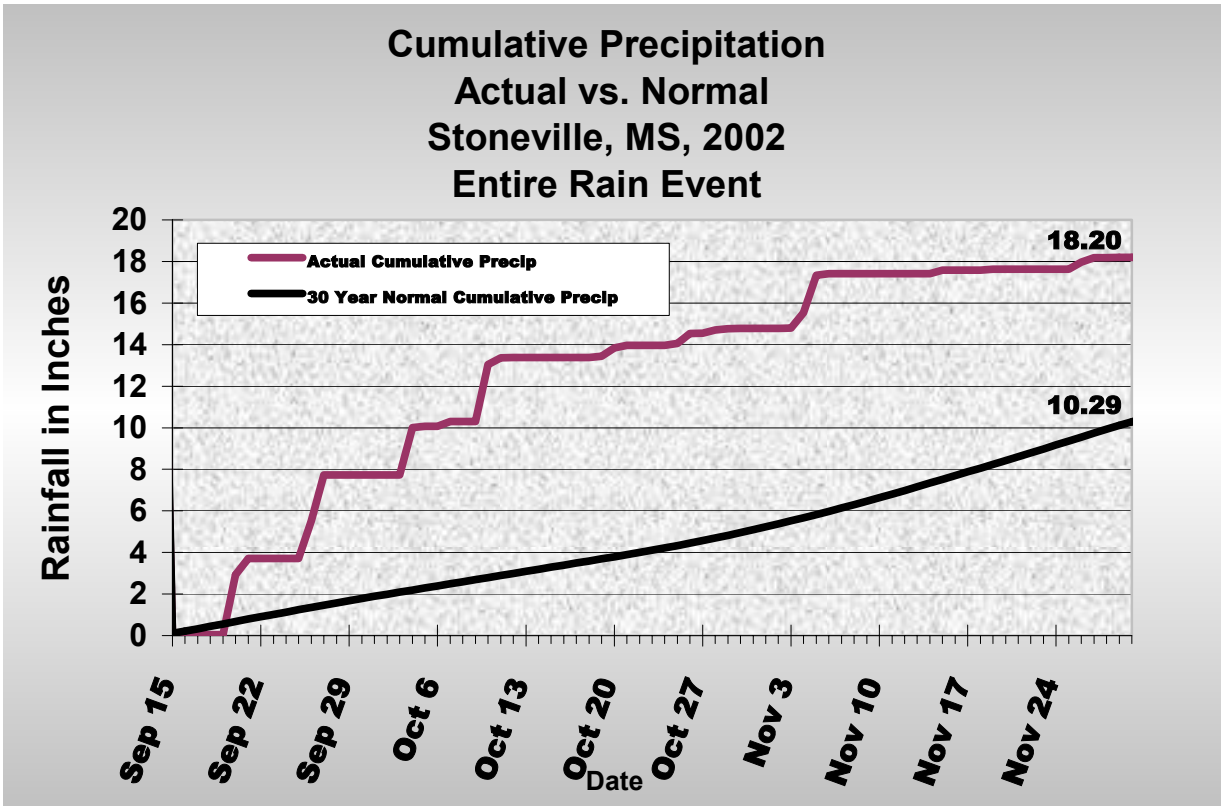

Figure 1. Accumulated Precipitation, NWS, Stoneville COOP weather station.

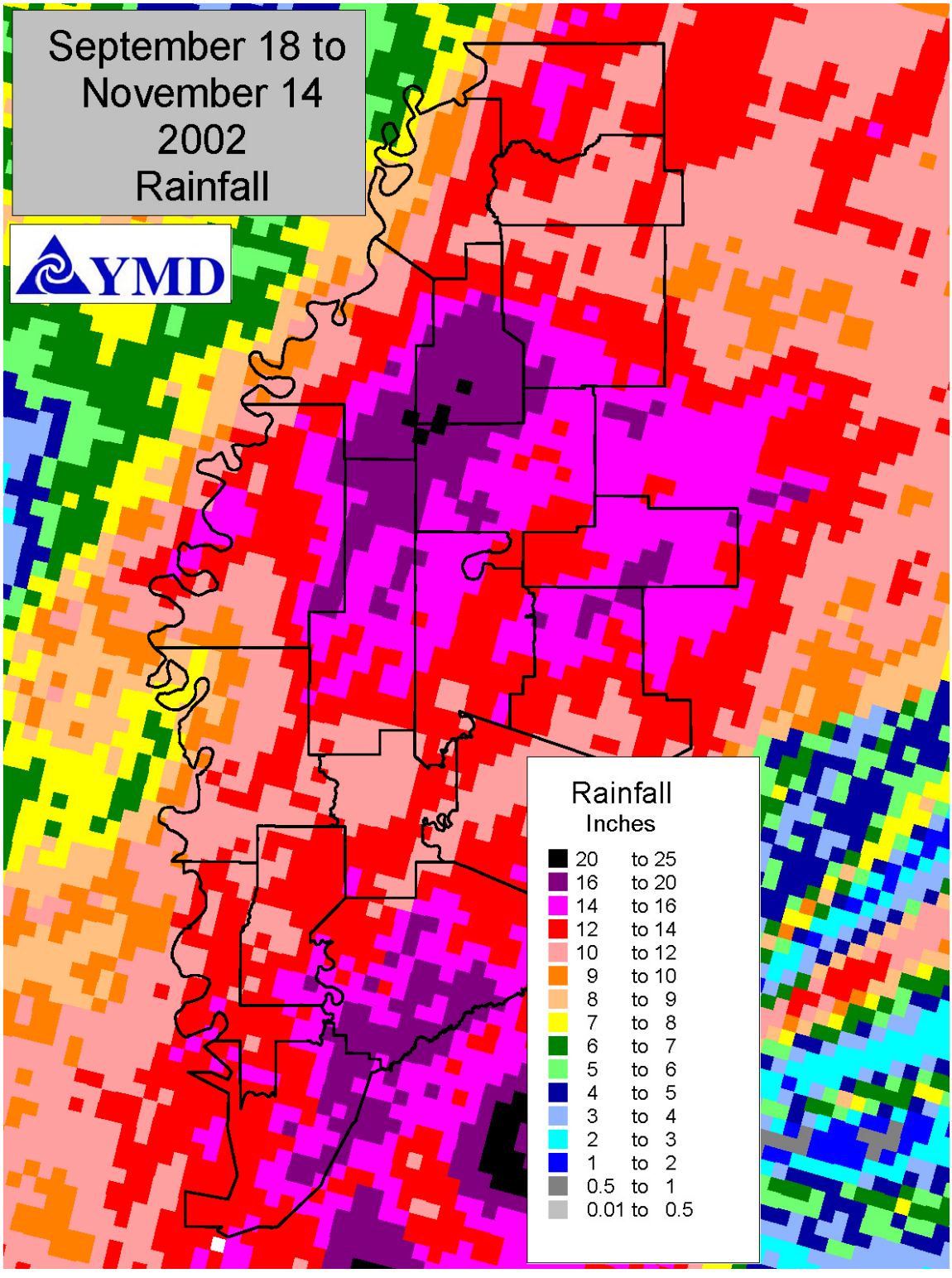

Figure 2. YMD compiled NWS Radar estimated precipitation.

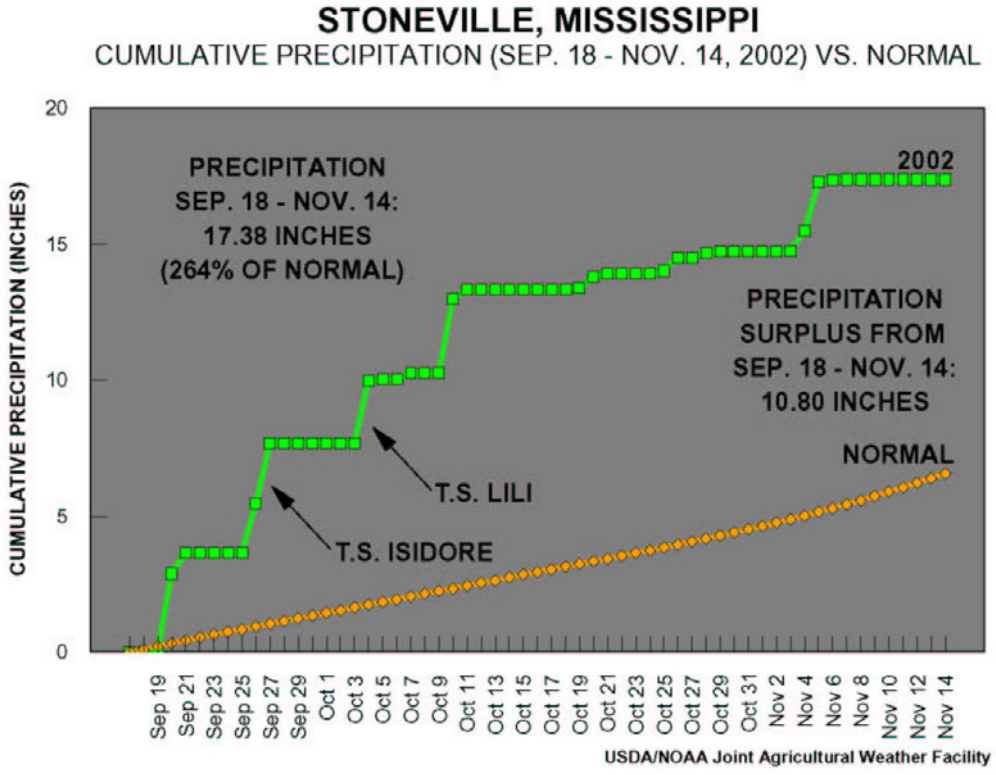

Figure 3. Accumulated Precipitation, NWS, Stoneville COOP weather station. Originally presented at National Hurricane Conference, 2003.

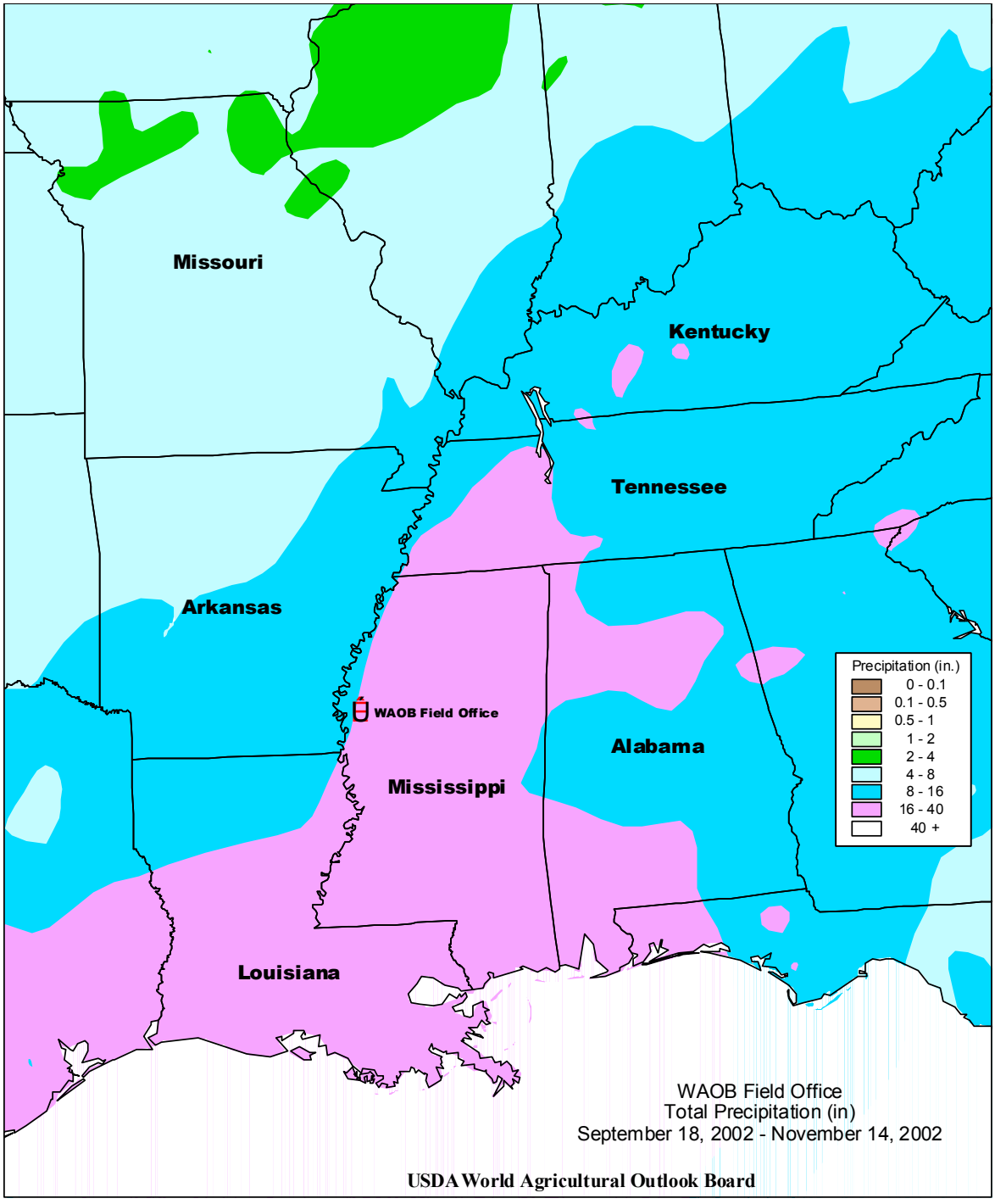

Figure 4. Total Precipitation recorded from NWS COOP weather sites.

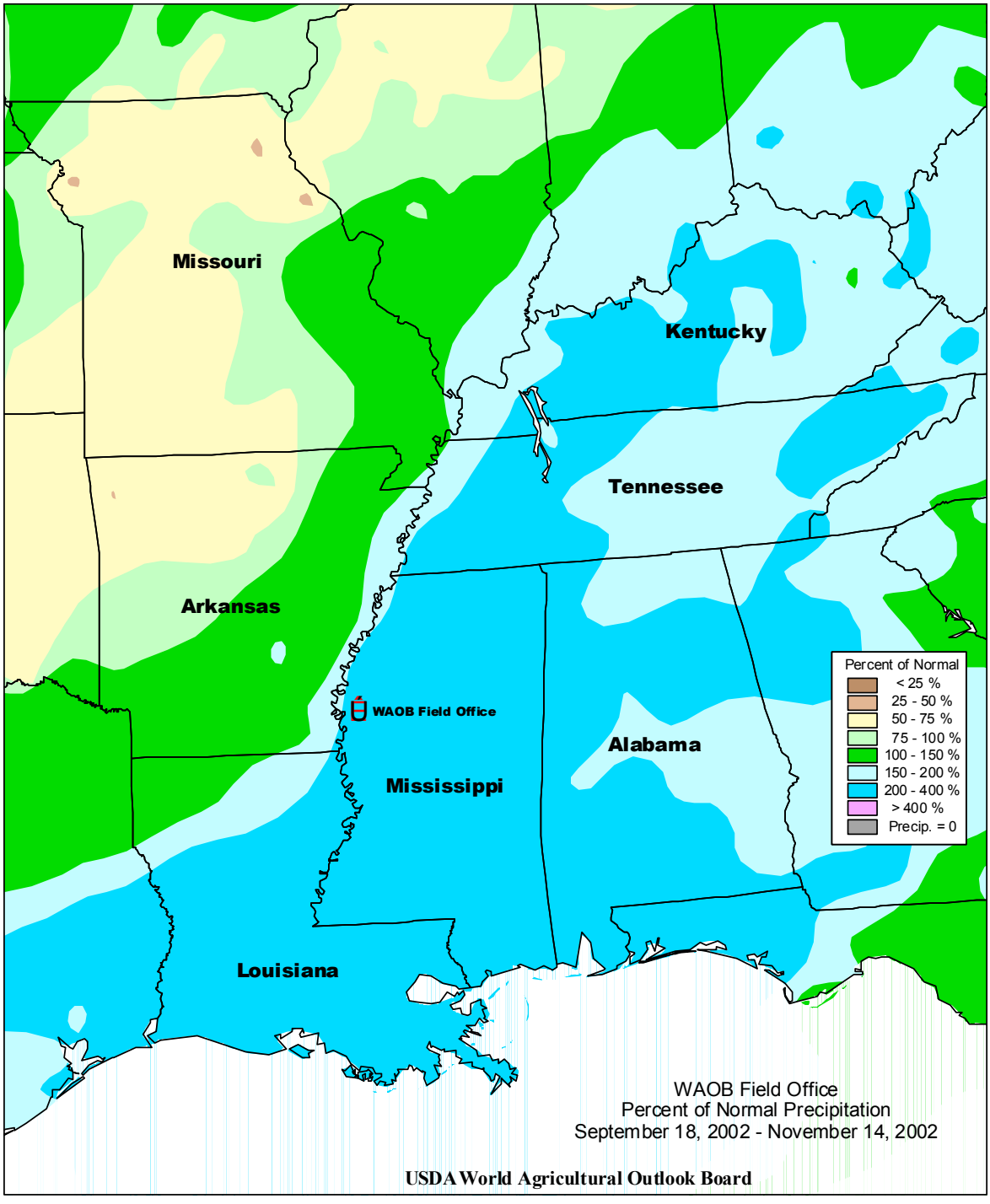

Figure 5. Percent of Normal Precipitation derived from NWS COOP weather sites.